THE VETERINARY RECORD

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888

No. 17. APRIL 28, 1951 VOL. 63.

MASTITIS IN PRACTICE

II. Treatment and Control, with Special Reference to Sulphone*

BY

JOHN BERGER, M.R.C.V.S.,
ALDERLEY EDGE, CHESHIRE,

AND

JOHN FRANCIS, B.SC., M.R.C.V.S.,
IMPERIAL CHEMICAL INDUSTRIES LIMITED, BIOLOGICAL LABORATORIES, WILMSLOW, CHESHIRE

The main features of mastitis encountered over a three-year period have been described in a previous paper (Berger & Francis, 1951) and the methods of clinical and bacteriological examination outlined. This paper deals with the concurrent observations on the treatment and control of mastitis.

It is obvious that, in a practice, milk samples could not be taken at a standard time after treatment. On the average 1·5 post-treatment samples were taken from lactating cows infected with *Str. agalactiae* and 1·2 in non-lactating cows. The following notation was used in classifying the clinical recovery of cases:—

0 Quarter non-functional.
1 Moderate yield of poor quality milk.
2 Reduced yield of normal or nearly normal milk.
3 Return to complete or almost complete function.

* 4 : 4′ diaminodiphenylsulphone. Dapsone has now been officially approved as the free name for this compound.

TABLE I

RESULTS OF TREATMENTS*—LACTATING AND DRY COWS

Treatment			Bacteriological severity† 1						2					
					Recovery						Recovery			
						Bacteriol. %						Bacteriol. %		
			No. quarters	Average clin. severity	Average clin.	1st treatment	No. quarters receiving 2nd treatment	2nd treatment	No. quarters	Average clin. severity	Average clin.	1st treatment	No. quarters receiving 2nd treatment	2nd treatment
Str. agalactiae	Total or average—all treatments	Lactating	23 (22)‡	2·5	2·85	86·4	2	95·4	25	2·7	2·8	64	3	76·1
		Dry	31	1·7	2·9	86·3	2	90·3	44	2·0	2·9	68·2	2	72·7
All other forms of mastitis§	Total or average—all treatments	Lactating	36 (34)	3·0	2·6	67·6	3	76·5	29 (23)	3·5	2·2	56·5	4	73·9
		Dry												

Treatment			Bacteriological severity† 3						4					
					Recovery						Recovery			
						Bacteriol. %						Bacteriol. %		
			No. quarters	Average clin. severity	Average clin.	1st treatment	No. quarters receiving 2nd treatment	2nd treatment	No. quarters	Average clin. severity	Average clin.	1st treatment	No. quarters receiving 2nd treatment	2nd treatment
Str. agalactiae	Total or average—all treatments	Lactating	9	2·8	2·4	55·5	1	66·6	41	3·1	2·1	46·3	6	58·5
		Dry	25 (24)‡	1·5	3·0	75			53 (52)	2·0	2·6	57·7	6	67·3
All other forms of mastitis§	Total or average—all treatments	Lactating	9	3·25	2·9	33·3	2	55·5	57 (52)	5·0	1·9	36·5	10	55·8
		Dry												

*. The results in this table refer to quarters in which 10 grammes of sulphone were injected.
†. A figure of "1" indicates a small number of bacteria and "4" a large number. (Berger & Francis, 1951)
‡. Figures in brackets are the number of quarters with complete data on bacteriological recovery.
§. Excluding infections with *C. pyogenes*.

TABLE II

THE RESULTS OF TREATING MASTITIS IN DRY AND LACTATING COWS

	Treatment	Dry cows							Lactating cows						
					Recovery							Recovery			
						Bacteriol. %							Bacteriol. %		
		No. of quarters	Average clin. severity	Average bact. severity	Average clin.	1st treatment	No. quarters receiving 2nd treatment	2nd treatment	No. of quarters	Average clin. severity	Average bact. severity	Average clin.	1st treatment	No. quarters receiving 2nd treatment	2nd treatment
Str. agalactiae	Sulphone-Penicillin	54	1·7	2·4	3·0	96·3	2	100	60	2·66	2·55	2·71	80	5	88·3
	Sulphone in oil	33	2·0	2·7	3·0	72·7	3	81·8	9	3·14	3·0	2·57	55·5	1	66·6
	Other treatments	66 (64)	1·9	2·8	2·18	42·2	5	50·0	29 (28)	3·07	2·9	2 07	21·4	4	35·7
	Total or average	(151)	1·8	2·65	2·8	68·2	10	75·0	97	2·8	2·75	2·5	60·8	10	71·1
All treatments	*Str. dysgalactiae*	53 (47)	3·5	2·4	2·5	80·8			43 (40)	4·3	2·8	2·0	55	7	72·5
	Str. zooepidemicus	4	5·66	4	0·75	50			12	5·9	3·6	1·33	16·6	1	25
	C. pyogenes	18 (12)	7·3	3·1	0	8·3			16	5·25	2·7	0·3	0·2		
	Str. uberis	24 (20)	2·2	1·8	2·25	40	3	55	34 (30)	3·15	2·8	2·5	46·6	4	60
	Str. faecalis	4 (3)	4·5	1·25	3	50			9	3·66	1·66	2·66	55·5		
	Unclassified streptococci	7 (5)	2·6	1·55	3	100			12	3·16	1·9	2·8	66·6	2	83·3
	Staphylococci	10	2·15	2·6	3	30			21	4·6	2·5	2·2	53·3	4	80
Total "Other Types" of mastitis*	Sulphone-Penicillin	42 (36)	3·0	2·2	2·9	83·3	1	86·1	60 (59)	3·6	2·65	2·2	57·6	13	79·6
	Sulphone in oil	19 (18)	3·0	1·8	2·3	55·5	1	61·1	15	3·9	2·6	1·54	38·4	2	53·8
	Other treatments	41 (36)	3·6	2·66	1·99	50	1	52·8	56 (46)	4·6	2·7	2·4	44·4	3	50
	Total or average	(90)	3·2	2·3	2·5	64·4	3	67·8	131 (120)	4·05	2·66	2·2	50	18	65·2
Sterile	Sulphone-Penicillin	8	2·4		2·8				9	3·66		2·6			
	Sulphone in oil	3	2·66		3·0				3	4·33		3			
	Other treatments	30	1·9		2·14				13	5·9		2·15			
	Total or average	41	2·0		2·4				25	4·9		2·4			

* This excludes sterile mastitis and that associated with *C. pyogenes*.

RESULTS

The results of treating mastitis in lactating cows were tabulated into four groups on the basis of the bacteriological severity of the cases. The same was done for dry cows and in both there was better bacteriological recovery in the cows lightly infected with *Str. agalactiae* than in those heavily infected (Table I). There was also better clinical recovery. The same tendencies were present in mastitis caused by other organisms.

Turning to Table II it will be seen that 96·3 per cent. of 54 dry quarters infected with *Str. agalactiae* recovered with a single dose of sulphone-penicillin and the remaining two quarters recovered with a second injection. Of 60 lactating quarters 80 per cent. recovered with one injection, which on the average was left in for 40 hours, and 88·3 per cent. after five had been treated a second time. Good results also were obtained with sulphone in oil in dry cows, but less satisfactory in lactating cows. Beijers, Berendsen and Hesse (1949) obtained 88 per cent. cures in lactating cows with sulphone-penicillin and 80 per cent. in dry cows with sulphone alone. Their percentages are based on small numbers, but are very similar to our own. The average recovery recorded following a single dose of 100,000 units of penicillin is 50 to 60 per cent. and no figures have been published indicating that any other treatment with a single injection is as effective as sulphone-penicillin: the results in dry cows with sulphone-penicillin are outstanding. Stableforth (1950) states that sulphone is efficient. "It often, however, causes some udder disturbance in milking cows and has, therefore, found its greatest use in dry cows in which it persists well and produces a high rate of sterilisation."

"Other treatments," which include sulphone in water, sulphone plus proflavine in water, oral sulphanilamide, etc., were much less satisfactory against *Str. agalactiae* in both dry and lactating cows. The difference between sulphone-penicillin and sulphone in oil on the one hand and "other treatments" on the other was less marked with the organisms causing sporadic mastitis. This is to be expected because these infections tend to recover naturally if the udder tissue is not severely damaged, whereas *Str. agalactiae* infection does not. Stableforth (1950) noted that the superiority of penicillin was less marked with organisms other than *Str. agalactiae*. Clinical recovery was not

markedly worse with " other organisms " than with *Str. agalactiae*. Examining the " other organisms " in more detail, it will be seen that *Str. dysgalactiae* and " unclassified streptococci " responded about as well as *Str. agalactiae*, but they were originally present in much smaller numbers. *C. pyogenes* responded least to therapy and *Str. zooepidemicus* was the next most resistant: both these organisms were present in very large numbers initially and gave rise to the most severe symptoms. Buxton (1948) noted that penicillin had little or no effect on mastitis associated with *Str. zooepidemicus*. We have seen only one case of proved *C. pyogenes* infection that recovered. It was a typical early case that occurred after the present survey was completed and *C. pyogenes* was present in small numbers. Three injections of sulphone-penicillin were given: the cow milked normally after calving and *C. pyogenes* was not isolated. Numerous cases of " summer " mastitis from which *Str. dysgalactiae* were isolated have responded well to sulphone-penicillin.

It is well recognised that *C. pyogenes*, acute *Str. zooepidemicus* and staphylococcal infections of the udder respond less well to penicillin, or other therapeutic agents, than do *Str. agalactiae* infections even when the latter are acute. Staphylococci are rather more resistant to penicillin than *Str. agalactiae in vitro*, but *C. pyogenes* and *Str. zooepidemicus* are more susceptible (Seeley, Anderson & Plastridge, 1945).

McDermot (1949) has discussed similar facts in relation to pneumonia. Pneumococci and Friedlander's bacillus are highly susceptible to chemotherapeutic agents *in vitro* and in experimental animals. In human pneumonia caused by either organism, there is no obvious mechanical barrier to the drug, yet pneumococcal pneumonia responds well to chemotherapy, but Friedlander's pneumonia does not. The reason for this different behaviour is that consolidation produced by pneumococci does not undergo necrosis, the alveolar framework remains intact and recovery can occur whenever growth of organisms is checked. On the other hand, consolidation produced by Friedlander's bacillus rapidly undergoes necrosis.

Spencer and McNutt (1950) have described the pathology of certain types of mastitis. In an interesting article describing the development of acute staphylococcal mastitis Turnbull (1950) points out that one could hardly expect a small dose of penicillin (relative to the size of the cow) to exert an effect on the major portion of the lesion when injected into the teat canal because absorption and rediffusion of the agent in the blood does not occur to an appreciable extent. It has long been realised, of course, that the immediate clinical response with sulphanilamide in acute streptococcal mastitis is often as good as with penicillin. Turnbull advocates the systemic use of large doses of penicillin and this doubtless is sound, but it is possible that the best results would be obtained by multiple local injections into the quarter as described by Sanders and Lockwood (1949) under the title, " Transcutaneous antibiotic therapy of localised soft tissue infections." They point out that with systemic treatment tissue concentrations may be only one-tenth of the blood-plasma concentrations and that much higher concentrations can be produced in an infected focus by direct injection than by systemic administration. Pus in well-localised lesions is aspirated, the cavity injected with antibiotic solution and then left filled with the solution but not under tension. If there is an acute cellulitis, the area is infiltrated with penicillin at a concentration of 1,000 to 5,000 units per c.c. The pain of the injection is greatly reduced if the penicillin is dissolved in 1 per cent. procaine. It is claimed that pain is greatly reduced in 24 hours with this treatment and that infections tend to recover within three days. " Healing occurs without necessity for incision, and drainage of subcutaneous necrosis takes place through liquefaction and removal of necrotic products via small sinuses." It would appear that the udder would be an ideal organ for this type of therapy which could be combined with sulphone-penicillin via the teat canal. The addition of a local anaesthetic would be valuable as the pain is very severe in some forms of mastitis. Begg and Whiteford (1950) have described work on these lines in mastitis, but it does not appear that they injected the penicillin into many sites. They did not find it of value in *C. pyogenes* mastitis.

The Present Approach to the Treatment of Mastitis

The original intention of leaving the injected sulphone in lactating cows for 72 hours has been largely abandoned, in-

Table III

Milk Concentrations Produced in Lactating Cows following the Injection of Sulphone in Liquid Paraffin after the Evening Milking on Three Successive Days

	Cow 3 2 grammes in all quarters								Cow 72 2 grammes in R.F. and R.H. quarters			
	a.m.				p.m.				a.m.		p.m.	
Quarter	R.F.	R.H.	L.H.	L.F.	R.F.	R.H.	L.H.	L.F.	R.F.	R.H.	R.F.	R.H.
Average, 1, 2 and 3 days	9·3	2·3	2·5	4·9	1·1	0·9	0·6	0·9	12·6	9·1	1·5	1·2
Total average	4·8				0·9				10·9		1·4	
	Cow 27 4 grammes in all quarters								Cow 42 4 grammes in R.F. and R.H. quarters			
Average, 1, 2 and 3 days	62·7	24·8	33·4	27·3	3·4	2·3	4·0	4·4	53·1	29·1	3·4	2·7
Total average	37·1				3·5				20·5		3·1	

The cows were giving 2 to 3 gallons of milk a day. On the morning of the fourth day, *i.e.*, 42 hours after the last injection, the average milk concentrations varied only from 0·9 to 1·5 mg. per 100 c.c. in all quarters of all cows.

jections now being left in for 24 to 36 hours. It became obvious, therefore, that a dose of 10 grammes of sulphone was wasteful because much of it was milked out. An experiment was carried out to ascertain the milk concentrations produced by smaller amounts. Doses of 4 or 2 grammes of sulphone in liquid paraffin were injected into all four, or into two quarters of two cows on three successive days. Milking continued normally and the results obtained are shown in Table III.

The injections were made after the evening milking and it will be seen that with the larger dose the average concentrations were 37·1 mg. per 100 c.c. in the morning and 3·5 mg. per 100 c.c. in the evening. The second morning after the last dose there were concentrations of about 1 mg. per 100 c.c. It is obvious that higher concentrations would be maintained in a cow not being milked and that therapeutic concentrations would be present for more than 36 hours. Assuming two quarters were injected with this dose, it has been shown (Francis, 1947) that blood concentrations over 1 mg. per 100 c.c. would be produced for longer than 36 hours. No special experiments were carried out in dry cows because it had been shown (Francis, 1947) that a very similar dose (5 grammes per quarter) produced blood concentrations of nearly 2 mg. per 100 c.c. for five days and milk concentrations of 3 mg. per 100 c.c. for 14 days.

Since the work described in this paper ceased, only selected milk samples have been examined bacteriologically. During this period penicillin has become freely available and it was used for a period in the treatment of clinical mastitis, but the impression was gained that the recurrence of symptoms was more frequent after procaine-penicillin alone, even when three doses of 100,000 units were used, than after sulphone-penicillin, and now about two-thirds of all cases in lactating cows receive sulphone-penicillin (see below). A few cows that did not respond to this treatment were treated with dibromopropamidine (Carmichael, Maclay, Johnson & Johnson, 1950) without further improvement. The following note gives an indication of the procedure now generally adopted.

In the treatment of lactating cows affected with acute or subacute mastitis, 4 grammes of sulphone* plus penicillin are used and the injection left in for 24 to 36 hours. Should the cessation of milking cause discomfort, some milk may be removed, but undue distension of the udder rarely occurs. Clots are usually present for two to three milkings, but progress can be assessed at the second visit 72 hours after injection, when a second similar injection may be given and left in for 24 to 36 hours. Although this second injection is likely to have rendered the secretion bacteriologically negative, return to clinically normal milk may take four to five days and it is only after this period that a third injection is attempted if there is still abnormality. Loss of yield occurs in a proportion of all cases of mastitis and there is no evidence that this occurrence is more frequent after the use of sulphone than after any other treatment.

In cows that are difficult to " dry-off " because the process precipitates an attack of mastitis, all four quarters are injected with 4 grammes of sulphone plus penicillin, but if at the time the secretions show any abnormality, 10 grammes of sulphone plus penicillin is used. The udder is then not stripped again until after calving. If, however, any quarter shows palpable inflammation or excessive curdy secretion, the combined injection is repeated five to seven days later and only left unstripped if the milk had returned to normal at the time of injection. Sulphone is also used as a routine in dry cows that have shown clinical mastitis at any time during the previous lactation. As already mentioned, detailed records have not been kept since the smaller dose of sulphone has been adopted, but the clinical results have continued to be excellent.

If parturition occurs within a week after a dry cow has been injected with sulphone there is a danger that the calf may ingest a toxic dose of the drug. Under these circumstances the owner should be warned to strip the quarters before the calf can suckle. It is likewise necessary to see that there are no calves at pasture with dry cows that have been injected recently.

If a number of apparently similar cases of mastitis occur in the same herd, a herd test is carried out. If *Str. agalactiae* infection is revealed as many cows as possible are treated with sulphone-penicillin when dry. Clinical cases in lactating cows are also treated with sulphone-penicillin and non-clinical cases in lactating cows with procaine-penicillin. It will be seen, however, from the following section that after routine treatment the number of infected quarters tends to become very small.

The Control of *Str. agalactiae* Infection in Practice

Stableforth, Hulse, Wilson, Chodkowski and Stuart (1949) have described attempts to eradicate *Str. agalactiae* from ten herds by simultaneous treatment of all quarters of all cows with five doses of 100,000 units penicillin at daily intervals, disinfection of cows and premises, and use of penicillin cream on udder and hands for 14 days after the beginning of herd treatment and for any cows subsequently infected or added to the herd. The herds contained 424 cows, of which 148 (35 per cent.) were infected with *Str. agalactiae*. The infection was eradicated from five herds at once, from another herd within three weeks by retreatment of one cow, from another in six months by subsequent treatment of seven cows (two being heifers infected at first calving), and from another herd in 14 months by subsequent treatment of 14 cows. Many of these treatments were retreatments of the same cows. Work was stopped early in one herd because of lack of farm co-operation. Seven herds were free from infection at the time of writing.

Francis (1949) treated infected quarters of cows and did not carry out disinfection, but as in the work reported here infected and newly purchased cows were milked last until they were shown to be free from infection. *Str. agalactiae* was eradicated from five herds in which 26·5 per cent. of the cows were infected at the first examination. Subsequent tests could not be carried out in one herd, but others remained free from infection for a year or longer.

During the course of the present investigation further observations have been made on the control of *Str. agalactiae* infection. In one herd of about 40 Ayrshire cows (Jessop) there had been one or two cows with clots in the milk during 1943 and 1944 and as these cases arose they were treated with sulphanilamide given orally. During 1945, 16 quarters that had shown clinical mastitis were treated with sulphone (chiefly when dry) and they all recovered. Late in 1945 several cases of mastitis developed which were indistinguishable from those observed previously and a herd test was carried out. *Str. agalactiae* was not isolated, but 19 quarters were infected with *Str. uberis*. Quarters with mastitis were treated with sulphone-penicillin. During 1946 and 1947 further occasional cases of *Str. uberis* and staphylococcal mastitis were treated. *Str. agalactiae* was not

* 4 grammes of sulphone are contained in a 12-gramme tube of " Udolac " (trade mark of I.C. (Pharmaceuticals) Ltd.) and 10 grammes in a 30-gramme tube of " Udolac." Both these tubes are marketed with the addition of 50,000 units of penicillin and the combined treatment is now nearly always used in lactating cows.

isolated at a herd test in July, 1946, but it was isolated from a cow purchased just afterwards. This cow was treated with sulphone-penicillin and *Str. agalactiae* was not isolated at a herd test in July, 1948.

In another herd of 19 Friesian cows (Ashbrook) two quarters in full lactation and seven which were dry, all affected with *Str. agalactiae* mastitis, were treated between August 12th, 1947, and February 24th, 1948 (four cows in all). A herd test carried out on March 22nd, 1948, showed that all these quarters had recovered and no other infection was detected, except in a cow kept in isolation, which was about to be sold. Eradication in this herd required 13 visits and 14 infusions. *Str. agalactiae* was not isolated in July, 1950, when a herd test was carried out.

A Shorthorn herd of 30 to 40 cows (Wild), in which mastitis had been very severe, was reduced to ten during the process of attestation. A herd test was carried out in May, 1948, and one cow found infected with *Str. agalactiae* in three quarters. These were infused with sulphone-penicillin and *Str. agalactiae* was not isolated from the herd in July, 1948. The herd has since been built up from maiden heifers and only occasional cases of mastitis encountered, which did not yield *Str. agalactiae*. By May, 1949, there were 30 to 40 cows in the herd, a number of cases of mastitis occurred and *Str. agalactiae* was isolated in June from one of the old cows. These cases of mastitis were treated and *Str. agalactiae* was not isolated at a herd test carried out in July.

Events in a mixed Ayrshire herd (Jackson) are outlined below:—

Quarters treated successfully between July 16th and Sept. 2nd, 1947		Number of quarters affected at first herd test, Sept. 16th, 1947	Number of quarters treated successfully, Sept. 25th to Oct. 31st, 1947		Number of quarters affected at second herd test, Nov. 15th, 1947	Number of quarters affected at third herd test, March 8th, 1948
Dry	Lactating		Dry	Lactating		
2/2	8/10	18	7/7 *	11/13 *	Two lactating. Both treated successfully.	0

* Another cow was found with two infected quarters, bringing the total to 20. If one includes the quarters treated before the first herd test, the total number infected with *Str. agalactiae* rises to 30 (17 cows). Visits, including three herd tests, number 25. Total infusions number 39 (seven not *Str. agalactiae*). It appeared that success had been achieved, but continued inexplicable breakdowns occurred in this herd, although there were no teat sores and the attempts to eradicate infection were abandoned.

The foregoing results indicate that regular bacteriological tests should be carried out on herds from which *Str. agalactiae* has been isolated. It is of interest, however, that herds may be free from infection in the absence of such control. We recently carried out a test on two herds of 70 cows that had been founded about four years ago from first-calf heifers. No bacteriological examinations had been made, but all cases of mastitis had been treated with large doses of penicillin. *Str. agalactiae* was not isolated. Hughes (1948) found three of 19 herds that were not infected with *Str. agalactiae*.

Apart from these herds it may be mentioned that herds 3 and 5 (Francis, 1949) have been free from infection for total periods of 100 and 200 weeks respectively; herds 1 and 4 have been sold. Following the last test in herd 2, in March, 1949, when it had been free from infection for 70 weeks, the herd gradually has been converted to an attested herd and none of the old cows are left. *Str. agalactiae* was found in four of the purchased cows and these were treated with sulphone-penicillin. A herd test in August, 1950, revealed one of 28 cows (SL. 936) infected with *Str. agalactiae*. This was a recently purchased cow in full milk, so she was treated with two doses of 100,000 units of penicillin in all quarters at an interval of 72 hours. She was free from infection in October, 1950, and the whole herd was free in November, 1950. In herd 6 cow 3 was again found infected in March, 1949 (235 weeks), after she had been free from infection at four examinations over a period of about 130 weeks. She was treated with penicillin and was free from infection at two examinations in August, 1950, as was the rest of the herd. Cow 1, which had been infected at one and 62 weeks, was killed on August 18th, 1949 (260 weeks), and the udder-tissue examined bacteriologically (Francis, 1949): *Str. agalactiae* was not isolated.

Summary and Discussion

Of 54 dry quarters infected with *Str. agalactiae* 96·3 per cent. recovered with a single dose of sulphone-penicillin and the remaining two quarters recovered with a second injection. Of 60 lactating quarters 80 per cent. recovered with one injection, which on the average was left in for 40 hours, and 88·3 per cent. after five had been treated a second time. Good results were also obtained with sulphone in oil, in dry cows, but less satisfactory in lactating cows. The results are similar to those obtained by Francis (1949) and appear to be better than those obtained with any other single injection. Cows lightly infected with *Str. agalactiae* responded to treatment better than those heavily infected. This difference was not observed by Francis (1949) when treating non-clinical cases of mastitis.

Infections with *Str. dysgalactiae* and unclassified streptococci responded about as well as *Str. agalactiae; Str. zooepidemicus* and *C. pyogenes* responded least well and the other organisms occupied an intermediate position. It should also be noted that "sterile" mastitis responded clinically to antibacterial therapy about as well as any of the types of mastitis associated with bacteria. We do not believe these facts indicate that specific antibacterial therapy exerts no real effect, particularly in *Str. agalactiae* infections. *C. pyogenes* and *Str. zooepidemicus* are more susceptible to the action of penicillin than is *Str. agalactiae*, and there is reason to believe that infections causing severe reactions in the udder might respond better to multiple local injections of penicillin combined with sulphone-penicillin via the teat canal than to other methods of therapy.

Most of the observations recorded in this paper were carried out with doses of 10 grammes of sulphone with or without the addition of penicillin. Now that the dose is left in for only 36 hours in lactating cows, such a large dose is unnecessary. A dose of 4 grammes of sulphone produces effective milk concentrations for 36 hours or more in lactating cows. Assuming two quarters were injected with this dose, it has been shown (Francis, 1947) that blood concentrations over 1 mg. per 100 c.c. would be produced

for longer than 36 hours. The dose of 4 grammes of sulphone nas given good clinical results and it is now used, combined with 50,000 units of penicillin, in preference to 100,000 units of procaine-penicillin for treatment of most cases of mastitis in lactating, as well as in dry, cows. It is particularly valuable in cows that develop mastitis when being dried off.

The two slightly unusual features of the above methods are that injected quarters are left for longer than the normal milking period and that a special effort is made to treat dry cows. Both these procedures were adopted in order to provide the best conditions for sulphone to act, but their value has received strong support from the pathological observations of McFarlane and Rennie (1950), who showed that, as one would expect, there is a much better penetration of an injected substance when there is not an active flow of milk from the alveoli, and that involuted tissue is much more easily penetrated by the injected substance than lactating tissue. They say "treatment of the dry cow would appear likely . . . to be a highly efficacious method."

The necessity for treatment other than direct injection into the teat-canal is described earlier in this paper and McFarlane and Rennie show clearly how useless it is to expect substances injected in this way to reach all parts of an inflamed udder. Curtis (1950) makes the same point and states that in acute cases a solution of 5 per cent. sodium sulphamerazine and 5 per cent. sodium sulphamethazine injected intravenously in doses of 250 to 300 c.c. "has saved twice as many cows affected with septicaemic or gangrenous mastitis as we were formerly able to save." It is, however, difficult to see why this treatment should be much better than the oral administration of sulphanilamide, combined with the local injection of penicillin. The local injection of sulphone-penicillin would produce the same effect because the injected sulphone not only produces a high local concentration but an effective blood and tissue level in addition. Multiple injections of penicillin directly into the udder tissue are also valuable and it is quite clear that much more than the routine injection of penicillin into the teat-canal is called for in severe cases of mastitis, especially in valuable cows.

It is shown that herds may become free of *Str. agalactiae* infection following routine treatment carried out over a period of time. In all, infection has been eradicated relatively easily from eight herds and two were found to be free from infection, but in two (No. 6 and Jackson) infection recurred in a rather unaccountable manner. This type of experience is quite common when dealing with other infectious diseases: it indicates the necessity for bacteriological control to ensure that infection does not become re-established.

Acknowledgment.—We are indebted to R. W. White and F. D. Vernon for their assistance in this work.

References

Begg, H., & Whiteford, W. A. (1950.) *Vet. Rec.* **62.** 103.

Beijers, J. A., Berendsen, H. L., & Hesse, N. G. W. (1949.) *Tidjschr. v. Diergeneesh.* **74.** 73.

Berger, J., & Francis, J. (1951.) *Vet. Rec.* **63.** 283.

Burton, J. C. (1948.) *Ibid.* **60.** 215.

Carmichael, J., Maclay, M. H., Johnson, A. V., & Johnson, L. (1950.) *Ibid.* **62.** 55.

Curtis, R. (1950.) *Vet. Med.* **45.** 283-285.

Francis, J. (1947.) *Vet. J.* **103.** 193-207.

———. (1949.) *J. comp. Path.* **59.** 226-244.

Hughes, D. L. (1948.) *Vet. Rec.* **60.** 659.

McDermott, W. (1949.) Symposia of the Section of Microbiology. *N.Y. Acad. Med.*, p. 92.

McFarlane, D., & Rennie, J. C. (1950.) *Austr. Vet. J.* **26.** 53-56.

Murnane, D. (1949.) *Ibid.* **25.** 85-94.

HERD FERTILITY IN CATTLE: A NOTE

BY

JOHN T. ABRAMS,

Department of Animal Husbandry, Royal Veterinary College, London

The importance of maintaining a high level of fertility in cattle in Britain needs no stressing. Without it the farmer must suffer financial loss because of enhanced maintenance costs, while the population of the country loses valuable food.

Among the causes to which the infertility which is periodically reported may be ascribed are, firstly, the invasion of the animal body by specific organisms and, secondly, faults of metabolism. While there may be instances of the first of these causes being a sequel to disordered metabolism, the present article is concerned only with fertility in its direct relationship to nutrition and, in particular, to mineral elements in the diet.

A recent review (Asdell, 1950) shows how little is known concerning the effects of diet on reproduction and how large are the gaps in existing knowledge. Vitamin E may be cited as an example of the difficulty presented by such problems, as well as of the extent of confusion which can be caused by premature reports.

Of the mineral elements phosphorus has long been known to be a factor concerned in the fertility of cattle. The early work of the South African school of investigators, which has been ably summarised by Theiler and Green (1931), proved conclusively that a marked deficiency of phosphorus in the rations of cattle leads to reduced fertility and, as a secondary effect, to disease associated with micro-organisms.

Since a high level of milk production from the herds in this country is desired, one must consider phosphorus deficiency from the point of view not only of the needs of the pregnant animal but also of those for high milk yields. In this connection it should be observed that the South African work was not done with cows which gave a large output of milk; consequently, direct comparison with cattle in this country is not possible.

Before considering what quantities of phosphorus it is desirable to have in the rations of livestock, it may be as well to indicate briefly the importance of this element in the animal organism. It is a major component of the bones, an integral part of certain lipoids which are essential to life, a necessary factor, in association with proteins and some members of the vitamin B complex, in various enzyme systems, and a vital agent in the formation and degradation of carbohydrates, lipoids and even, perhaps, of proteins (Anon., 1948; Morris & Ray, 1939). It would seem a justifiable assumption, which is supported by evidence from various sources, that increased metabolism should increase the need for dietary supplies of phosphorus.

The problem of attempting to assess the daily phosphorus

Sanders, E. K., & Lockwood, J. S. (1949.) Symposia of the Section of Microbiology. *N.Y. Acad. Med.*, p. 103.

Seeley, H. W. (Jr.), Anderson, E. O., & Plastridge, W. N. (1945.) *J. Dairy Sci.* **28.** 887.

Spencer, G. R., & McNutt, S. H. (1950.) *Amer. J. vet. Res.* **11.** 188.

Stableforth, A. W., Hulse, E. C., Wilson, C. D., Chodkowski, A., &Stuart, P. (1949.) *Vet. Rec.* **61.** 357.

———. (1935.) *J. Min. Agric.* **41.** 945-955.

———. (1950.) *Vet. Rec.* **62.** 219.

Turnbull, P. (1950.) *Vet. Rec.* **62.** 255.

Erratum.—The foo notes to Figs. 5 and 6, p. 287, should read "Key: as in Figs. 4 and 3 respectively."

requirements of cattle is simplified if one considers, firstly, the researches which have been made in order to ascertain how much of the element is needed for satisfactory pregnancy and, secondly, how much phosphorus is present in milk. The former of these quantities clearly includes the maintenance charge for the dam plus that required for the developing calf, while, equally clearly, the latter sets the minimal limit of intake for milk production.

Foremost in the first group of researches may be placed those of the South African school. Du Toit and Bisschop (1929), during a three-year experimental period, found that the addition of a daily supplement of 5 oz. of bone-meal (about 18 grammes of phosphorus) to a phosphorus deficient ration served to maintain a high level of fertility in the animals receiving it, as compared with a much lower rate in the control group of cows. Theiler and Green (*loc. cit.*) have suggested that about 13 grammes of this element (30 grammes of P_2O_5) per day probably will sustain a cow through a normal pregnancy.

It should be noted that in this case one is not dealing with the amount of phosphorus needed *physiologically* by the animal, but with the quantity present in an average diet. The 13 grammes of Theiler *et al.* includes more than the physiological minimum in order to account for (*a*) phosphorus which may not be absorbed from the intestine, (*b*) inefficiency of utilisation of absorbed phosphorus and (*c*) other possible causes of loss. While such a *practical* allowance of the element suffices for normal pregnancy, more may be needed for the increased metabolism of lactation. It is not possible, however, to separate this supposed increase from the enhanced requirements due to the secretion of phosphorus in milk.

Milk contains about 4 grammes of phosphorus per gallon, the proportion being relatively unaffected by changes in the nutrition of the cow and the response to a deficiency taking the form of a fall in milk yield rather than a variation of composition. Clearly, then, a ration must supply an average of at least 4 grammes of phosphorus for each gallon of milk produced, but the amount by which this amount must be multiplied in order to take into account faulty absorption or utilisation is not known precisely. It is usually assumed that 7 to 8 grammes of the element must be supplied in the diet for each gallon of milk produced.

When, therefore, one discusses "phosphorus deficiencies" it is necessary to state which of the above standards, the physiological or the practical, is the one at issue. If one selects the practical standards, then it needs to be fully understood that *these may hold good only for the precise conditions under which they were formulated, and for no others*. In the case of a cow producing three gallons of milk per day, for example, many observers tend to speak of a deficiency of phosphorus if the quantity in the ration does not amount to about 13 plus 3 by 8 grammes per day, ignoring the fact that this is the amount deemed to be needed under one set of practical conditions; the assumption may be quite invalid for the example in question. Even the table set out in O'Moore's (1950) very careful paper makes no mention of this fact, although the standards quoted apply to American conditions.

When the literature which records attempts to correlate phosphorus deficiency with fertility in cattle is examined, almost invariably one is compelled to take into account other possible variables at the same time. Some of these, indeed, have been the subject of much enquiry, but are not always remembered in connection with particular investigations. Of these disturbing factors three important ones are, firstly, the effect of other elements present in the food, secondly, the influence of vitamin D and, thirdly, the chemical form in which the phosphorus occurs in rations.

With regard to the first of these, dietary calcium has long been recognised to be concerned with the absorption of phosphorus from the intestine. Perhaps because of the precipitation of insoluble, unabsorbable calcium phosphate, the calcium of foods is believed to prevent the absorption of some of the dietary phosphorus. This was shown by balance experiments by Otto (1932), among others. A dietary phosphorus deficiency may thus be absolute, in that insufficient of the element is present to satisfy physiological requirements, or it may be conditioned, where there is diminished absorption of phosphorus which might otherwise appear to be adequate.

As mentioned previously, herd infertility, in association with aphosphorosis, was first clearly demonstrated by the South African school of investigators. Concerning the effects of the Ca/P ratio, however, there seems to be a certain amount of disagreement and confusion between the various groups of workers. Theiler *et al.* (*loc. cit.*) say, "Wide variations of the calcium phosphorus ratio are of relatively little significance in comparison with absolute deficiency of phosphorus." On the other hand, O'Moore (*loc. cit.*, page 221) noticed increased severity of general symptoms of aphosphorosis produced by high Ca/P ratios, as compared with narrower ratios, even though the pasturage providing the phosphorus was equally deficient in both cases.

With regard to conditions in Britain, unless the tables giving the phosphorus content of the common animal feeding-stuffs are very much in error, the average ration fed to cattle should more than provide the physiological requirements for milk production under average conditions. It is unfortunate that Hignett (1950) gives no data on this important matter for the herds with which he was concerned. In many instances he must have thought them adequate by present *practical* standards, for he says, "Where the quantities (*i.e.*, of calcium and phosphorus) were sufficient when viewed separately, the ratio appeared to bear some relationship to the conception rate. In the vast majority of cases where there was a wide ratio due to excess of calcium, there was herd infertility." On the other hand, Theiler (1931) believed the ratio to be of less importance when the phosphorus present in the ration was adequate.

Part of the confusion doubtless is due to the fact that these observers were considering the *practical* requirements for the element, which, as previously explained, can have value and significance only with respect to the conditions under which they were obtained.

Since dietary calcium certainly does play a part in phosphorus absorption and utilisation, it is relevant to consider other variables which may affect these phenomena. Of these by far the most important one under field conditions would seem to be vitamin D. In this connection, although it has long been recognised that the vitamin influences the deposition of calcium and phosphorus in bone and although the cow at the height of lactation may draw upon its skeletal reserves of these elements, Hignett says, "Vitamin D need have little consideration" where herd infertility is concerned. O'Moore came to the conclusion that it could be disregarded in his investigations, too. The assumption is open to question on several grounds.

Firstly, the experiments of Wallis (1938), who studied the effects of vitamin D deficient rations on mature Holstein cows, may be quoted. The diet used included bone-meal,

the feeding system being such that each animal received 20 to 25 grammes of calcium and 10 grammes of phosphorus daily, plus 10 grammes of calcium and 7·5 grammes of phosphorus for each gallon of milk produced. The diet was free from biologically measurable vitamin D. All of the animals were maintained indoors save for exercise at night. One of the minor—and probably ineffective—criticisms which may be levelled against the experiments is that only five animals were used. On the other hand, the beasts were weighed regularly and milk records were kept. In addition, there were periodic estimations of milk and blood phosphorus and calcium, several balance experiments with these elements were carried out and there was careful observation of the condition and breeding efficiency of the cattle. For the diets the average Ca/P ratio was one which most workers would commend, namely, 1·6 (CaO/P_2O_5 :: 1 : 1).

On this ration, despite its favourable Ca/P ratio and the fact that the supplies of the elements ostensibly were adequate, the " animals became stiff, the knees bent, the spine became rigid. . . ." The balance experiments showed that heavy calls were being made on the mineral reserves of the cows. Although this depletion is " normal " in cows at the height of lactation, its reversal by vitamin D was attributed by Wallis to the action of the vitamin and not to a simple diminution of milk yield. His belief received support from the rapid elevation of blood inorganic phosphorus from 1 to 2 mg. to about 7 mg. per 100 ml. of plasma, soon after the administration of vitamin D. Most important with respect to the present argument was that breeding records for the animals were available for at least two lactations prior to the experiment and " the regularity shown by these records stands out in striking contrast to the fact that none of these cows showed oestrum during the period of vitamin D deficiency." The administration of the vitamin served to correct these conditions. In this well-planned experiment it is worthy of comment that the balance experiments showed a Ca/P ratio of 2·6 during withdrawal and of 2·1 during deposition of the elements in the body.

There is indirect evidence, provided by reports by Ewer (1950) of osteomalacia in young cattle and of rickets in calves and lambs in Britain, that vitamin D is a factor which must be taken into account in practical farming and especially in cases of conditioned phosphorus deficiency. Since Ewer found that vitamin D could be used to prevent the diseases mentioned, there would appear to be no question of absolute phosphorus deficiency, despite the part which aphosphorosis can play in the genesis of rickets. Ewer's observations followed upon similar work on lambs in New Zealand (Fitch & Ewer, 1944).

Theiler and his collaborators were engaged in research in a country where sunlight is photochemically active and can be depended on to produce vitamin D by the irradiation of suitable sterols in the skin of the animal. Furthermore, they were dealing with cattle of no very high level of production and requirements. On the other hand, Hignett and O'Moore, among others in this country and in Eire, and Ewer and his co-workers in New Zealand have been concerned with regions which, because of their latitude (Tisdall & Brown, 1929) and of their consequent long dull winters, enjoy nothing like the potency of South African sunshine. One would expect Ca/P ratios to be less significant generally in sunny, hot climates than in Britain and Eire, for example.

This assumes, of course, that the diet contains little or no vitamin D in the last-named areas. Indeed, unless it is supplied artificially in the diet, this is likely to be the case, for though well-cured hay may provide some vitamin D, a climate too poor to act upon the skins of exposed cattle is unlikely to be much more efficient with respect to hay. Unless fish-liver oil, or synthetic vitamin D is added to the ration, there are no other sources worthy of mention. It is unfortunate that the data of Webster,* concerning calcium, phosphorus and herd fertility in New Zealand cattle, are not freely available. With reference to O'Moore, whose studies of cattle seem to have been made with cattle largely dependent upon grazing, it is noteworthy that he says, " If . . . excess of calcium is significant only in conditions of absolute phosphorus deficiency, some other reason must be sought for the occurrence of ' bog lame ' on pastures of from fair to normal phosphorus content." Vitamin D may well be the answer. Taken collectively it seems to the writer that the isolated investigations of Theiler *et al.*, Hignett, Wallis, Ewer and O'Moore do indeed point to this. It may not, of course, be the only other variable.

The problem appears to be a complex one, but no advantage would be secured in this note by too great a deviation from the main path of the argument. It may be noted, however, that O'Moore says that the symptoms of aphosphorosis in Eire invariably disappear after winter feeding of concentrates to the beasts, but they may reappear in the following summer after the cattle have been for a month or more at pasture. Vitamin D deficiency due to lack of sunlight is less likely to occur in summer than in winter, so that O'Moore's statement might seem to exclude consideration of vitamin D from the problem, were it not for the fact that more than one variable has been changed simultaneously. Cattle are being compared during different seasons *and* under different dietary régimes—nor are these the only differences.

Hignett (*loc. cit.*) includes in his paper a table showing the effect on cattle fertility of the liming or slagging of pastures, from which it would seem that basic slag and lime differ little in their results. This is both interesting and surprising since slag not only contains a smaller proportion of calcium than limestone but also has an appreciable phosphorus content.

There appears to be no general experimental evidence to show that the phosphorus content of milk from Friesian herds is greater than that from Guernseys. Since the average Friesian cow gives a greater volume of milk than the Jersey, one would expect that its phosphorus requirements would be the more difficult of the two to satisfy. Surprisingly, however, in view of this belief, Hignett reports that it is the Jersey cow which most easily has its fertility impaired by a mineral imbalance. The experimental observation is not to be gainsaid, but again it may be asked whether phosphorus deficiency, pure and simple, is the sole cause of the phenomenon.

There are other aspects of the matter which call for attention, as, for example, the problem of the different chemical forms in which the phosphorus of foods occurs. As Mellanby (1949) and others have shown, phytate phosphorus in the digestive tracts of some species produces different effects from ordinary, inorganic phosphate. On the other hand, the total phosphorus content of a ration gives no indication of the chemical form in which the element is present. Consequently, no precise information as to its nutritive value is provided. Indeed, so far as practical farming is concerned, it is doubtful, not only whether the farmer is ever likely to be in possession of such details, but also whether there would be any point in providing him with these analytical minutiae. Under

* Quoted by Hignett (*loc. cit.*).

the natural feeding conditions of the grazing animal, the chief function of vitamin D, though not the only one, may be to control the effects of imbalanced calcium and phosphorus in the herbage. The use of vitamin D to counteract certain forms of herd infertility, where these are believed to be associated with the mineral fraction of the diet, would seem to merit trial. In fact, considering the results of Wallis with vitamin D deficient cows, when using a Ca/P ratio as well balanced as 1·6 (CaO/P_2O_5 :: 1 : 1), one may well ask what chance an average farmer has of keeping to such a favourable ratio on the foods available to him. Yet even this ratio offered no protection against disease in the absence of the vitamin. Moreover, the use of vitamin D, which should be quite practicable under field conditions, might reconcile the possibly conflicting claims of the animal nutritionist and the soil chemist (*vide* Gould, 1950).

This, of course, does not mean that there can be, or ought to be, complete disregard of the Ca/P ratio. Experiments have clearly shown that, in certain of the heavier, rapidly growing breeds of dog, *e.g.*, the Great Dane, the dosage of vitamin D needed to prevent rickets increases very greatly as one increases the Ca/P ratio. This kind of breed difference may occur in cattle, but there is no evidence from trials under British conditions of environment and feeding to help in this matter. With Wallis's results especially in mind, the writer is here inclined to the view that at present the vitamin D intake is of more practical importance than the Ca/P ratio, so far as Britain is concerned.

There may well be some who will feel dismayed at the prospect of yet another factor which may have to be accounted for in the feeding of cattle. To the extent that we prefer to depart from the " natural " animal with respect to milk yield, however, the price of greater attention to details of feeding and management will have to be paid. In some parts of the world supplies of calcium, phosphorus and vitamin D may be such that, from this angle, there is no barrier to fertility in cattle, while in others an imbalance of the mineral elements may be corrected by vitamin D. If, however, Man chooses to live in lands where the natural supply of vitamin D is uncertain, where also there may be some imbalance of calcium to phosphorus and where a cow is expected in one season to provide milk which would suffice for two or three calves more than the one she actually produces, then supervision will always need to be first class, otherwise disease is almost bound to occur from time to time.

In conclusion it may be timely to expand slightly the general argument. One may refer again to Hignett's paper, where it appears to have been concluded that vitamin B, like vitamin D, needs no consideration with respect to herd fertility. While it is true that the cow, under " natural " conditions, probably carries in its rumen the means of providing all of the vitamin B complex it is likely to require, the high-yielding dairy cow, an unnatural animal on an unnatural diet, is quite a different proposition. Baker and his colleagues (1947) have shown how much the nature and functions of the microflora of the alimentary tract of ruminants are affected by the diet of the host. While the thesis is not being put forward here, that vitamin B and herd fertility are necessarily correlated in the cases under consideration, the close relationship between certain members of the B complex and the phosphate grouping in a number of metabolic reactions deserves mention. Morris and Ray (1936) showed long ago that high-yielding dairy cows may not be able to derive (presumably again by microbial synthesis) all of the amino-acid, lysine, which is needed for high production; the same may well be true of many other factors. The results of experiments done within one particular environment and under set conditions, ought not to be assumed to hold good under quite different circumstances. In particular the application to highly productive animals of feeding standards obtained under basal, or near basal, conditions must be especially suspect.

Hignett (*loc. cit.*, page 661) mentions the possibility of excessive dietary calcium interfering with the absorption and utilisation of certain trace elements. This is a legitimate assumption, but if, indeed, vitamin D is involved in herd fertility, either calcium and phosphorus are the only mineral elements affected or there must be some hitherto unsuspected relationship between vitamin D and the trace elements.

Furthermore, in view of the metabolic functions of phosphorus, previously mentioned, not only in the formation of bone, but in the synthesis and degradation of carbohydrates, lipoids and perhaps even proteins (Anon., 1948), any deficiency of the element, real or conditioned, must be presumed to have far-reaching effects. This would be particularly true of pregnancy and lactation. If, in fact, as biochemical research is tending to show, protein synthesis is involved, then enzymic and hormonal systems as a whole may easily be affected. The effects of phosphorus deficiency upon the gonads or pituitary would thus constitute particular examples of general application.

Modern biochemical work, beginning with the experiments of Schoenheimer and Rittenberg (1949), has shown how fluid is the living body and how closely the metabolism of one component is linked with others. It is to be hoped that in the future, cognisance of this dynamic nature of living tissues will lead to attempts to view animals " in the round " and not as the sum of one or two simple chemical reactions.

One hopes, too, that the field of discussion will remain wide and, in connection with this present subject of herd fertility, that none of the possible operative factors will be neglected because no one has deemed it worthy of investigation. Unduly hasty premises tend to initiate fruitless lines of research. Furthermore, should they prove subsequently to be erroneous, the publicity which they often receive because of their economic importance, means that they take far longer to eradicate from public opinion than to establish. Where animal breeding is concerned it is surely provident to be cautious.

Acknowledgment.—I wish to thank Professor N. J. Scorgie and Mr. G. A. Willis for their helpful criticisms during the preparation of this note.

References

Anonymous. (1948.) *Nutrition Reviews.* **6.** 198.
Asdell, S. A. (1950.) *J. Dairy Sci.* **32.** 60.
Baker, F., & Harriss, S. T. (1947.) *Nutr. Abstr. Rev.* **17.** 3.
Du Toit, P. J., & Bisschop, J. (1929.) Fifteenth Ann. Rept. of Director Veterinary Services, Union of South Africa.
Ewer, T. K. (1950.) *Vet. Rec.* **62.** 603.
Fitch, L. W., & Ewer, T. K. (1944.) *Aust. Vet. J.* **20.** 303.
Gould, G. N. (1950.) *Vet. Rec.* **62.** 669.
Hignett, S. L. (1950.) *Ibid.* **62.** 651.
Mellanby, E. (1949.) *J. Physiol.* **109.** 488.
Morris, S., & Ray, S. C. (1939.) *Biochem. J.* **33.** 1209.
O'Moore, L. B. (1950.) *Irish Vet. J.* **4.** 198 & 218.
Otto, J. S. (1932.) Eighteenth Ann. Rept. of Director Veterinary Services, Union of South Africa.
Schoenheimer, R. (1949.) " The Dynamic State of Body Constituents." Harvard Univ. Press.
Theiler, A. (1931.) *Vet. Rec.* **11.** 1143.
———, & Green, H. H. (1931.) *Nutr. Abstr. Rev.* **1.** 359.
Tisdall, F. F., & Brown, A. (1929.) *J. Amer. Med. Ass.* **92.** 860.
Wallis, G. C. (1938.) *J. Dairy Sci.* **21.** 315.
Webster, W. M. (1929 & 1939.) See Hignett above.

CLINICAL COMMUNICATION

AN OUTBREAK OF BOVINE MASTITIS FROM WHICH YEASTS WERE ISOLATED, AND ATTEMPTS TO REPRODUCE THE CONDITIONS EXPERIMENTALLY

P. STUART

MINISTRY OF AGRICULTURE, WEYBRIDGE

A herd of 26 cows in milk had been treated with infusions of penicillin oil wax suspension daily for five days, in a *Streptococcus agalactiae* eradication experiment in Middlesex during 1948. Fifteen quarters of eleven cows developed an acute mastitis between the second and seventh days after the end of the treatment. There was severe induration of the udders, a marked drop in milk yield and a febrile reaction of about 105° F.; the udder secretions consisted of large yellow clots in a watery supernatant fluid. The mastitis lasted about a week without treatment and infusions of penicillin had no beneficial effect in a few quarters which were treated.

Yeasts were isolated in pure culture from all affected quarters in numbers ranging from 1,000 per ml. to innumerable in 0·1 ml. On 5 per cent. sheep blood agar colonies resembled those of some udder diphtheroids, but on glucose agar the colonies were very large and produced a typical yeast-like odour. The yeast unfortunately was not fully identified and the cultures have since been lost; it belonged to the genus *Candida* but differed from *Candida albicans* and the other commoner species. Yeasts which were similar in morphology and colonial appearance to those isolated from the secretions were found in brewer's grains which were being fed to the cows at the time of the investigation, but they were not compared critically with those isolated from the cows.

EXPERIMENTAL INFECTION OF COWS

1. *With Mastitis Secretions.*—Seven quarters of the udders of three cows were infused with seven secretions from field cases and in two quarters of one cow a mastitis similar to that described above was produced after 16 hours and three days respectively. Yeasts were isolated from these quarters in pure culture.

Transmission was also effected in a fourth cow by the infusion of secretion taken during the febrile stage from this experimentally produced case; an attempt to passage this to a fifth was unsuccessful. A sample from the fifth cow taken 18 hours later was infused into a sixth cow and an acute mastitis was produced from which yeasts were isolated in pure culture. One more passage was attempted, but did not give a positive result.

II. *With Cultures.*—A profuse growth of the yeasts of more than 3,000,000 viable organisms per ml. was obtained in glucose broth six hours after a heavy inoculation. Sixteen quarters of five cows were infused with doses ranging from 1 ml. of 1 in 1,000 dilution up to 20 ml. of undiluted culture; no clinical mastitis resulted.

Secretions from three field cases were inoculated into the chorioallantoic sac of three batches of embryonated eggs and incubated for seven days; the fluids of one batch contained yeasts in small numbers and the other two batches were sterile. These fluids were infused into three quarters of a cow and the udders of three goats. The quarter receiving the allantoic fluid containing yeasts developed an acute mastitis seven days later and yeasts were cultured from the purulent secretion. The other quarters and the udders of the goats remained normal.

III. *With Filtrates.*—Secretions from six field cases were filtered through Seitz EK pads or Gradocol membranes and infused into the udders of three cows; no clinical reactions developed.

DISCUSSION

There are few reports in the literature of yeasts or yeast-like fungi associated with bovine mastitis. Rolle[1] described five cases in cows which were being fed brewery by-products and Murphy and Drake[2] recorded ten infections of the udder with yeast-like fungi; these latter were identified as a species of Trichosporon and the authors succeeded in reproducing the condition experimentally. Andersen and Jorgensen[3] reported six cases in cows which became infected after penicillin infusions and in which the distilled water used as a solvent of the penicillin was contaminated with yeasts. In the cases herewith described the penicillin used was in an oil wax suspension and in collapsible tubes. No yeasts could be cultured from this suspension and the source of infection was probably the brewer's grains which were being fed at the time of treatment.

SUMMARY

An outbreak of acute mastitis following infusion of udders with penicillin, from which a yeast of the genus *Candida* was isolated, is described.

The condition was reproduced experimentally by the infusion of udders with mastitis secretions and with egg embryo cultures but not with glucose broth cultures of the yeast.

Acknowledgments.—I wish to express my thanks to Dr. G. C. Ainsworth, of the University College of the South West, Exeter, for examining the yeast.

REFERENCES

1 ROLLE, M. (1934.) *Deuts. tierärztl. Wschr.* **42.** 385.
2 MURPHY, J. M., & DRAKE, C. H. (1947.) *Amer. J. vet. Res.* **8.** 43.
3 ANDERSEN, J. B., & LETH JORGENSEN, K. (1949.) *Nord. Vet.* **1.** 958.

REVIEW

[Nutritional Deficiencies in Livestock. R. T. ALLMAN & T. S. HAMILTON. (1949.) *FAO Agricultural Studies No. 5* pp. iv + 102. Washington: FAO Document Sales Service. (London: H.M.S.O., price 5s.)]

This, the fifth in the series of booklets issued by the Food and Agricultural Organisation, is virtually a text-book and, with its excellent illustrations and useful selection of references, should be on every veterinary surgeon's bookshelf.

The 12 short chapters deal with the importance of feeding balanced rations to livestock; soils and nutrition; toxicity of excess food constituents; animal losses resulting from improper feeding; feed wastage caused by unbalanced rations; symptoms of nutritional deficiencies in dairy cattle, pigs, poultry, beef cattle, sheep, horses and mules; and the nutritional requirements of goats.

The emphasis is upon observations made in the U.S.A., and this to a degree lessens the value of the text in this and other countries, but it would be churlish to criticise in detail what can only be a selection from the very extensive literature now appertaining to nutritional deficiencies. The suggestion might be made, however, that a similar publication—which need be no larger than some of the N.V.M.A. Special Publications—dealing specifically with conditions encountered in Great Britain would be of tremendous value at the present time to those in general practice.

REPORT

ANIMAL HEALTH SERVICES: REPORT FOR THE YEAR 1948

In his history of veterinary literature (vol. **IV,** page 134) Sir Frederick Smith reviews the early Reports of the "Veterinary Department of the Privy Council Office" as they were called from 1876 to 1882: "As early as 1883 the significant title 'Agricultural Department' replaced that of 'Veterinary Department.' From 1889 to 1891 'Veterinary Department' appears in the title following the words 'Board of Agriculture,' and for the years 1892-93 we have the clear and definite statement that the Annual Report is by the Director of the Veterinary Services." Smith emphasises that these changes are not accidental but reflect the status of the Department. It is probably unfortunate that the straightforward title, "Veterinary Department," was ever abandoned.

The Reports of the Proceedings under the Diseases of Animals Acts, which were published before the war, were inferior to many of the early reports, and particularly so when compared with contemporary publications. The report covering the war years, 1938-47, was in some ways the worst that was ever published; as pointed out by a correspondent (*Vet. Rec.* **62.** 126), "the pre-war reports of the Proceedings under the Department of Animal Health were always published as the reports of the C.V.O. and were signed by him," whereas the report concerning the important war years could be read from cover to cover without discovering that there was a C.V.O. or even an Animal Health Division.

The report under review is an improvement, in that it is the Report on Animal Health Services for the year 1948, but it contains no introductory statement signed by the C.V.O. giving a general picture of the position.

There was no outbreak of *foot-and-mouth disease* anywhere in Great Britain in the first eight months of 1948, and Scotland and Wales remained free throughout the year. From September 7th, 1948, however, until the end of the year, 15 outbreaks occurred in England. The appearance of the disease coincided with a heavy wave of infection in Belgium and France, where the incidence was particularly high in the latter half of the year; from July to December there were nearly 2,000 outbreaks in Belgium and over 10,000 in France. It is believed that birds migrating from the Continent of Europe brought infection to Great Britain and were thus responsible for some of the outbreaks.

Enquiries were made into 5,211 reported cases of suspected *swine fever,* but only 27 outbreaks were confirmed.

During the year 69 outbreaks of *sheep scab* were confirmed in 12 counties. This is the lowest number recorded for many years and does not include a single outbreak in Scotland, which has now been free from the disease for seven years. In the control of sheep scab dips containing benzene hexachloride increasingly are being employed, as only a single dipping is required. The total number of dips of all kinds approved at the end of 1948 was 233. These 233 dips, which are sold under 1,079 titles, are the products of 69 manufacturers. At the end of 1948 there were 119 approved disinfectants; these preparations were made by 68 manufacturers and retailed under 551 titles.

During 1948 118 outbreaks of *anthrax* were confirmed in Great Britain, 95 being in England, five in Wales and 18 in Scotland: 117 cattle and eleven pigs were affected. Vaccination with anthrax spore vaccine of animals in the Nene Valley of Northamptonshire, in which the pastures have, for some years, shown evidence of heavy infection, was continued in 1948. The pastures are believed to have become infected by the overflowing of the river, which is polluted by the effluent from tanneries. The vaccination of 833 animals on 18 premises was undertaken during 1948 as compared with 1,130 animals on 28 premises in 1947. No case of anthrax was confirmed in any vaccinated animal, but eleven unvaccinated cattle contracted the disease.

In 1948, for the second year in succession, only one outbreak of *parasitic mange in an equine* was confirmed.

The epizootic of *fowl pest* which commenced early in 1947 and reached its peak in November of that year was, by the beginning of 1948, abating rapidly. The successful campaign against the epizootic was helped greatly by the stringent restrictions on sales, exhibitions and movements of poultry which were applied at that time over the whole of England and Wales. The 267 outbreaks of fowl pest that occurred during 1948 were widely scattered, but were particularly numerous around London and Birmingham. In August it was found that turkeys had been responsible for setting up fowl pest in domestic fowls with which they were in contact, though the turkeys themselves showed little evidence of disease.

A total of 6,111 birds were examined *post mortem* at the Ministry's Laboratories under the free services scheme; 3,696 birds came from English flocks and 2,415 from Scottish flocks. During the year, 213 cases of disease were the subject of veterinary investigation. Eighty-seven were diagnosed as bacillary white diarrhoea and 33 as tuberculosis.

The satisfactory progress made under the voluntary *Tuberculosis (Attested Herds) Scheme* was continued in 1948. At the end of 1948 attested herds contained about 1,445,000 cattle, or nearly 17 per cent. of all the cattle in Great Britain. The number of cattle in attested herds and the proportion of attested cattle to total cattle in the three countries were: England, 668,000 (11 per cent.); Wales, 253,000 (27 per cent.); Scotland, 524,000 (36 per cent.). In 1948 the incidence of reactors at tuberculin tests of all attested herds was 0·34 per cent. The proportion of reactors at tests of T.T. and Certified herds which were not attested was 1·33 per cent. There was a small further decline in the number of cattle slaughtered under the Tuberculosis Order in 1948, when 6,320 cattle were slaughtered, compared with 6,545 in 1947. Total compensation paid to owners was £67,634, or an average of £10 14s. per animal compared with an average of £8 18s. 10d. in 1947.

Three cases in which the presence of *Br. melitensis* was reported in samples of milk from three dairy herds occurred in July, 1948. One of the herds was in Staffordshire, in which county the two cases recorded in 1940 and 1947 had occurred; the other two were in Shropshire and Suffolk.

The following are the numbers of calves and maiden heifers vaccinated in 1948 against *bovine contagious abortion* under the *Calf Vaccination Scheme*:—

Great Britain	302,538
England	206,400
Wales	23,864
Scotland	72,274

At the end of 1948 the number of herds in the scheme totalled 64,424 (England, 49,366; Wales, 9,284; Scotland, 5,774).

A total of 114 dogs, 29 cats, ten canines and 15 felines imported into this country died whilst undergoing quarantine. Distemper caused more deaths among the dogs than any other disease and cat influenza was responsible for the death of most of the cats. During the year three dogs

died of rabies while in quarantine kennels; two came from Burma and one from India. *The period of quarantine of one of these dogs was extended because it became ill during the last few days of the period; its death occurred rather more than six months after the date of its importation.* The other two dogs which were affected with rabies died ten days and four and a half months respectively after arrival in this country. Eight cases of rabies have occurred in imported dogs in quarantine since the end of the war in 1945. Apart from cases occurring in quarantine, the country has been compietely free from rabies since 1922.

Three quarantine stations have been established, largely to provide a safeguard against the risk of exporting animals infected with foot-and-mouth disease. Since 1928 over 10,000 animals have been exported through the quarantine stations and in no instance has any one of these animals been responsible for carrying the infection of that disease into the countries into which they have been imported. This indicates that the precautions taken in this country are, in fact, effective. The total number of animals exported through the three quarantine stations in 1948 was 1,011, comprising 558 cattle, 308 sheep, 126 pigs, 17 goats and two llamas. In 1947 the corresponding total number was 1,151.

In describing work at the Veterinary Laboratory it is shown that vaccination against *brucellosis* with Strain 19 vaccine leads to the virtual eradication of the infection and that " breakdowns " are due to other causes. There was little difference in the response to *Str. agalactiae* infection under régimes varying from five doses of 100,000 to 200,000 units and three doses of 100,000 units of penicillin, 85 to 95 per cent. of cures being obtained. Penicillin concentrations in the milk 72 hours after injection of procaine penicillin in arachis oil with 3 per cent. aluminium stearate were equal to those at 48 hours after the same dose of calcium penicillin in arachis oil and beeswax. There was no evidence that persistent strains were penicillin resistant.

An aerobic streptococcus and a symbiont are sometimes present in cases of " *summer mastitis* " and are thought to play a part in the genesis of the disease.

Klebsiella pneumoniae (Friedländer's pneumo-bacillus) was isolated from an outbreak of wasting and non-pneumonic cough associated with pericarditis in sheep, and a case of severe *pan-ophthalmitis* at the laboratory (" untreatable except by excision of the eyeball ") recovered without any other treatment than 500,000 units penicillin per day intramuscularly.

A chronic toxicity test in a variety of animals, in which 3·57 mg. of DDT or 0·21 gramme of the gamma isomer of benzene hexachloride were given daily per kg., revealed no ill-effects, except some tainting of the meat. The scouring induced by *molybdate administration* to cattle in stalls, or on molybdenised Weybridge pasture, could be controlled by oral administration of copper sulphate at the usual daily rate of 2 grammes, but it was also observed that single intravenous injections of small amounts of copper were much more effective. As little as 100 mg. Cu controlled scouring in young animals for several weeks despite continued ingestion of molybdate. Cattle on " teart " pastures (25 to 60 p.p.m. Mo on dry matter) were generally found to show low blood copper, but scouring and poor thriving were also found immediately outside the " teart " area, associated with hypocupraemia and normal copper and molybdenum content of pastures. No clear relationship between hypocupraemia and excess of molybdenum in pastures has yet been established in Britain.

Various disinfectants have been tested on *Newcastle disease* virus. Coal-tar derivative disinfectants proved to be the most effective. The action of formalin was slow at 2° C., but was greatly accelerated at 37° C. Virus (amnio-allantoic fluid of infected embryos) exposed on filter paper at temperatures just above and below freezing point remained viable for more than 100 days. Virus on filter paper stored at 37·5° C. was inactivated in six to nine hours. Virus in faeces survived for 72 hours when stored at 37·5° C. Virus in infected carcases stored at 2° to 7° C. survived for more than 140 days in the bone marrow, for 98 days on the skin and for more than 140 days on the skin of undressed carcases stored at the same temperature.

Virus was demonstrated in the skin of dressed Hungarian table poultry in cold storage.

Although ducks and geese in contact with Newcastle disease-infected poultry rarely exhibit symptoms of the disease, the haemagglutination-inhibition and serum neutralisation tests showed that many exposed ducks and geese became infected. Experiments showed that artificially infected ducks and geese excreted the virus for a period of two to four days.

Dealing with the work of the Veterinary Investigation Service, *E. rhusiopathiae* infection of sheep is described following dipping in baths containing DDT and benzene hexachloride, neither of which is bacteriostatic. Lameness, caused by infection of joints, occurred in adult sheep and in lambs: some lambs died.

The Veterinary Surgeons Act of 1948 is outlined and there are the usual appendices.

It will be seen that this report contains much information and is in some ways superior to its predecessor, but it must be stated that it is a document that gives little satisfaction: some pre-war reports from the Colonial Service were superior. One feels confident, however, that under Sir Thomas Dalling's leadership there will be a rapid improvement in quality. In particular, maps and graphs are required, illustrating the progress of the scheme to eradicate bovine tuberculosis, as was done in the U.S.A. and other countries, and the progress of fowl pest and swine fever.

It is not only in the preparation of annual reports that the Animal Health Division lags behind, but in the publication of clinical and scientific papers. Members of the Division must see a great deal of material: why is it that they so seldom publish an article of clinical or scientific interest in *The Veterinary Record* or other public journal? This decline in publication occurred as soon as the present whole-time veterinary service was created (*Vet. Rec.* (1945.) **57.** 144) and recovery is long overdue.

It is realised that the Animal Health Division and particularly its senior officers are hard pressed at the moment, and it may be difficult for them to realise, when dealing with events from day to day, how important it is that there should be a proper published record of their work: it is important to the reputation of their Department, and in a country where Government departments are taking over more and more functions it is an essential of democratic freedom that they should maintain or create the tradition of publishing sufficient information to form the basis of an intelligent public opinion.

J. F.

WEEKLY WISDOM

What a wonderful medium through which to do good . . . there is no boundary to the world of cricket.—Sir DONALD BRADMAN.

ABSTRACTS

[Problems of Swine Reproduction. Nalbandov, A. V. (1950.) *Vet. Med.* **45.** 477–479.]

Of the sows and gilts raised annually in the United States for breeding, about 3,000,000 are sterile. Anatomical and endocrine abnormalities account for about 5 per cent. of the causes of this sterility. The commonest anatomical abnormality is hydrosalpinx, and it is usual for both fallopian tubes to be involved. Constrictions in the tubes cause them to fill with fluid and debris and so prevent completely any union of eggs and sperm. This condition is usually found in gilts rather than sows, being rare in the latter. No infective organisms can be isolated from the contents of the hydrosalpinx, nor can the condition be induced in normal females. Sterility from this cause is permanent and incurable.

Other causes of sterility in sows are blind uterine horns, or missing portions of the reproductive tract. In some cases one uterine horn may be blind, whilst the opposite is patent. Fertilised eggs may be recovered from this latter side, although pregnancy in such an "open" side is rare, and when it does occur it consists of one or two piglets. The fluid accumulating in the blind horn may be toxic and thus prevent pregnancy in the sound horn. Where one uterine horn is missing completely, pregnancy is possible in the remaining horn, but again litters will be very small, hardly more than one or two little pigs.

Cystic ovary is another common cause of sterility in pigs. Whereas diagnosis of the foregoing conditions may be impossible, that is not the case with cystic ovaries in pigs. Unlike cows and mares, sows do not show symptoms of nymphomania when the ovarian follicles are cystic. These large cysts usually found in sows' ovaries are devoid of oestrogen. Heat periods recur at unpredicted intervals instead of the usual 21 days. In some cases no heat is observed. This irregularity is one diagnostic symptom of cystic ovaries in the sow, and *the other symptom is an enlarged clitoris.* In the ovarian cysts large amounts of progesterone are found, and this hormone is believed to be the cause of the enlargement of the clitoris, as it is known to have an effect similar to that of the male sex hormone.

D. J. A.

* * * * *

[Studies in the Vitamin C Metabolism of the Pig. Braude, R., Kon, S. K., & Porter, J. W. G. (1950.) *Brit. J. Nutrit.* **4.** Nos. 2 & 3. 186–198.]

The sow's colostrum and milk are richer in vitamin C, than those of most other species studied, except the guinea-pig. The blood plasma level is not markedly changed during farrowing, nor is the urinary excretion of vitamin C. Metabolic experiments with pairs of pigs reared in metabolic cages have been made. The pigs were given sow's colostrum followed by goat's milk, whilst one of each pair received vitamin C, the other being deprived of it. Growth was satisfactory, and vitamin C excretion in the urine was measured daily. During the first two days, (*a*) the pigs receiving vitamin C excreted 10 to 20 mg., whilst (*b*) the pigs deprived of the vitamin excreted 2 to 5 mg. During the next six to ten days, (*a*) excreted 5 to 10 mg., and (*b*) 2 to 5 mg. After eight to 12 days (*a*) excreted 20 to 30 mg., and (*b*) 10 to 20 mg. This suggests that the piglet has a high vitamin C requirement during the first week of life, or else it does not start to synthesise the vitamin until about one week old. Chlorbutanol given to the pigs did not increase the urinary excretion of vitamin C.

The blood concentration of vitamin C in the serum of ten piglets at birth was 3 to 4 mg. per 100 ml. This level fell during the first week and remained at about 1·0 mg. per 100 ml. for two pigs getting vitamin C, and about 0·5 mg. per 100 ml. for the six pigs deprived of the vitamin. There was no increase in the blood level corresponding to that in the urine at the eighth to 12th days. Total amounts of vitamin C were measured in piglets at birth and after one to two weeks on a diet deficient of the vitamin. The mean values 140, 140 and 245 mg. show that the piglets could synthesise vitamin C from birth, and suggest that the low urinary excretion during the first week probably was due to their high requirement for vitamin C at this age.

D. J. A.

QUESTIONS IN PARLIAMENT

Slaughterhouses: "Closing Tendency Reversed"

Mr. Alport (April 16th) asked the Minister of Food whether he is aware that suffering is being caused to animals by the Government's decision to close the smaller slaughterhouses; and whether he is now prepared to reconsider it.

Mr. Webb: I cannot agree that the closing of small slaughterhouses—which took place early in the war under the then Minister of Food—and the use of the larger and more efficient ones has caused more suffering to animals. On the contrary, it has meant many improvements. Many of the small pre-war slaughterhouses not now in use were quite inadequate, unhealthy and would be unsuitable for use now without costly repair and reconstruction. We are building two experimental slaughterhouses at Guildford and Farenham, and I hope soon to make a statement about the building of other new slaughterhouses.

Brigadier Prior-Palmer: Despite what the Minister said about the larger slaughterhouses, would he institute a more searching enquiry into this matter as very disturbing reports are reaching hon. Members about the cruelty which is practised in slaughterhouses to-day?

Mr. Webb: If I could have evidence I should be very glad indeed to investigate it.

Sir Ralph Glyn: Would the right hon. Gentleman consider an alteration to the present rules about slaughtering casualty animals —animals which have broken legs, for instance—which have to be taken miles to slaughterhouses authorised by his Department?

Mr. Webb: That matter has been brought to my notice and we have looked into it. I should like further evidence. If evidence could be given on that subject we might be able to do something about it.

Lieut.-Colonel Sir Thomas Moore: In view of the fact that the number of slaughterhouses has been cut down from 14,000 before the war to about 600 now, would the right hon. Gentleman not call a halt to the closing of further slaughterhouses, even in spite of the fact that experimental slaughterhouses are being built, in view of the congestion of animals which is inevitable at present?

Mr. Webb: We are not closing any more. Last year we opened some and this year we are opening more. We are reversing the recent tendency.

Mr. Hutchinson (April 18th) asked the Minister of Food whether he is aware of the unsatisfactory conditions prevailing in many abattoirs and slaughterhouses, resulting in unnecessary suffering to animals awaiting slaughter; and if he will now make a statement on the steps he proposes to secure improvement.

Mr. Webb: I do not agree that there is generally, unnecessary suffering to animals awaiting slaughter except in so far as the process of slaughter is inevitably unpleasant. Certainly many of the premises are ill-sited in urban districts and badly out of date, but often rebuilding is the only remedy and a widespread rebuilding programme is, I am afraid, out of the question at present. We are, however, making such improvements as are within our capacity, including the building of some entirely new slaughterhouses with the most modern equipment.

Mr. Baker White (April 19th) asked the Minister of Food if he is aware that there is much cruelty in slaughterhouses throughout the country, including overcrowding of animals awaiting slaughter, the beating of the said animals by the drovers and that the use of the humane killer is not general; and if he will make a statement on what action he proposes to improve these conditions.

Mr. F. Willey: My right hon. Friend cannot accept the implica-

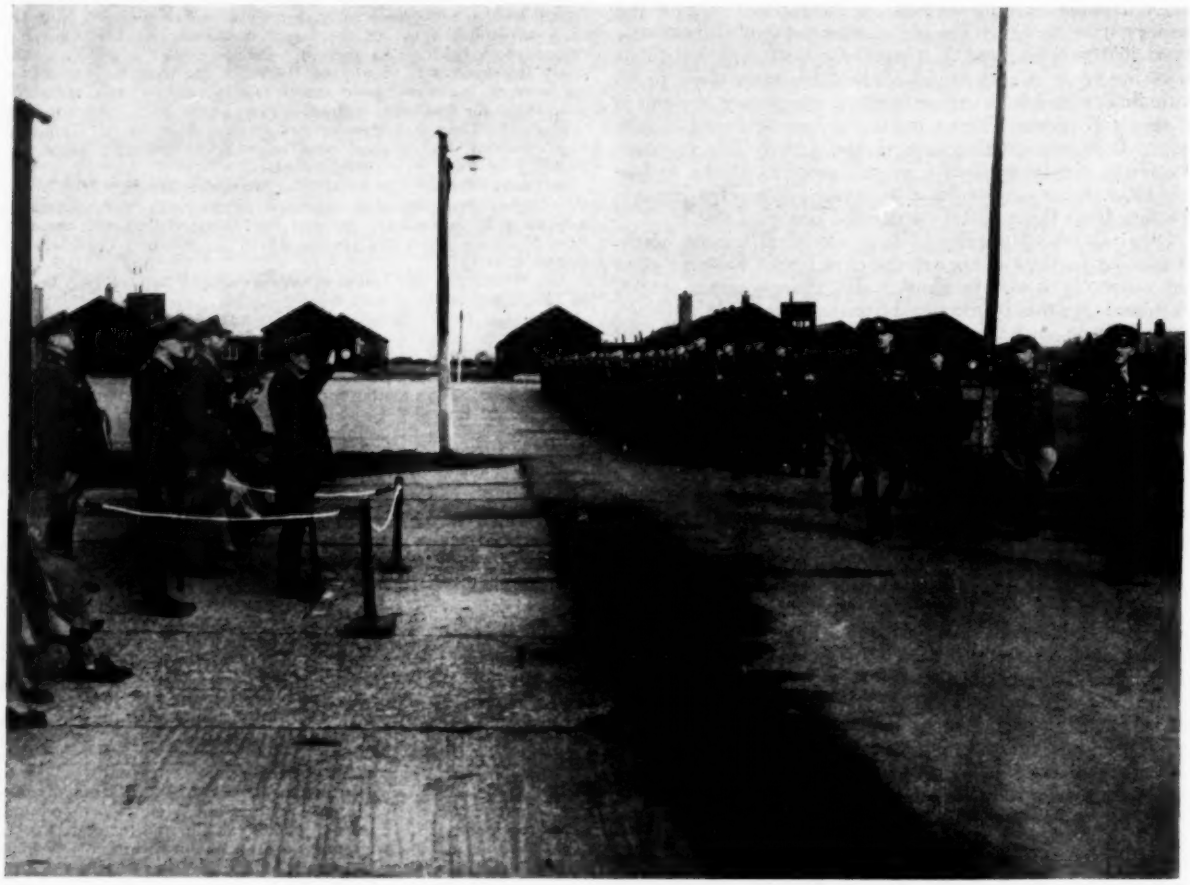
(*Continued at foot of next page*).

Army Veterinary and Remount Services

Brigadier Heveningham Takes the Salute

In our issue of March 10th we intimated the assumption of office by Brigadier A. G. Heveningham, O.B.E., as Director of the Army Veterinary and Remount Services, in succession to Brigadier J. J. Plunkett, C.B.E., and outlined his distinguished career.

The photograph reproduced below shows the new Director taking the salute during a march past of the personnel of the R.A.V.C. Depot, Melton Mowbray, on March 15th, 1951.



tion in the hon. Member's Question. The vast majority of drovers and slaughtermen employed in connection with the slaughter of animals for the meat ration are ordinary decent folk used to handling animals and as keen as we all are to avoid unnecessary cruelty. Every precaution is taken to see that the animals are properly transported and looked after whilst awaiting slaughter and not only are the provisions of the Slaughter of Animals Acts fully observed, but our instructions require that sheep shall be stunned before slaughter even though the Act of 1933 does not require this to be done in all areas. If the hon. Member has any specific case of alleged cruelty in mind, I hope he will let me have details so that it can be investigated.

. . . . .

Pig Keeping (Defence Regulation)

Mr. Turton (April 19th) asked the Minister of Agriculture whether, in view of the present meat shortage, he will extend Regulation 62b so far as it affects pig keeping for a further period of 12 months.

Mr. T. Williams: No, Sir. On June 21st last I gave notice that after June, 1951, Defence Regulation 62b would be replaced by what is now Section 12 of the Allotments Act, 1950, and I see no reason to alter this decision now.

Mr. Turton: Surely, at that time the meat ration was not quite so small as it is at present. Does the Minister realise that unless something is done these council tenants will, after July 1st, be at a grave disadvantage because they will no longer be able to purchase pig meat in order to supplement the meat supply?

Mr. Williams: As I explained on the Report stage of the Act referred to, I did not think that there should be any ban on pig keeping. Indeed I appealed then, and I think that local authorities and private landlords are responding to the appeal, for people to be allowed to keep pigs whenever it is reasonable for them to do so.

. . . . .

Tortoises (Import)

Mr. H. Hynd (April 19th) asked the President of the Board of Trade whether, in view of the high rate of mortality of tortoises if subjected to transport during their hibernating season, he will consider the desirability of introducing an order prohibiting their importation into this country between September 1st and April 30th.

Mr. H. Wilson: The import licensing powers conferred on the Board of Trade under the Import, Export and Customs Powers (Defence) Act, 1939, are intended primarily to safeguard the balance of payments, and I do not think it would be appropriate to use these powers for such a purpose.

Mr. Hynd: Is my right hon. Friend aware that this is a serious matter? Has his attention been called to the recent incident at

Plaistow involving over 200 tortoises and the one in October, 1950, at Peckham, involving some 6,000 tortoises? Is he aware that the Zoological Society of London strongly supports the efforts to get a close season, as suggested in my Question?

Mr. Wilson: I am sure that the whole House will share the regret of my hon. Friend about these incidents, but I must reiterate that this is not a question which can be dealt with by import licensing powers. If it were to be dealt with at all, it would require special legislation.

Sir William Darling: Why does not the right hon. Gentleman stop the importation of tortoises altogether? Surely they are not indispensable.

Mr. Wilson: I do not see why such a control should be applied. If the people of this country require tortoises I do not see why they should not be imported. The matter raised by my hon. Friend could be dealt with in other ways.

NOTES AND NEWS

Diary of Events

Apr. 28th.—Annual General Meeting of the Association of State Veterinary Officers, at the Royal Veterinary College, London, N.W.1, 2 p.m.; Annual Dinner, at the Criterion Restaurant, Piccadilly, 6.30 p.m.

May 1st.—Meeting of the Midland Counties Division, N.V.M.A., at Birmingham (The Medical Institute, 154, Great Charles Street), 2.30 p.m.

May 1st.—Meeting of special Sub-committee of the Editorial Committee, N.V.M.A., 2.30 p.m.

May 3rd.—Annual General Meeting of the Central Veterinary Society, at the Royal Veterinary College, Camden Town, 6 p.m.

May 5th.—Meeting of the Biochemical Society, in the Department of Biochemistry, University of Oxford, South Parks Road, Oxford, 11 a.m.

May 9th.—Herts and Beds Division, N.V.M.A.: Luncheon and Annual General Meeting at Barnet (Salisbury Hotel), 1 p.m.

May 9th.—Meeting of the Editorial Executive Committee, 2.30 p.m.

May 9:h.—Meeting of the Society for the Study of Animal Breeding, at the Royal Veterinary College, London, N.W.1, 2.15 p.m.

May 10th.—Annual General Meeting of the Southern Counties Division, N.V.M.A., at Winchester (Royal Hotel, Peter Street), 6 p.m.

May 16th.—Spring Meeting of the Eastern Counties Division, N.V.M.A., at Colchester (Red Lion Hotel), 2.30 p.m.

June 6th.—108th Annual General Meeting of the Royal College of Veterinary Surgeons at 10, Red Lion Square, London, W.C.1, 12 noon.

June 6th.—Annual General Meeting of the Victoria Veterinary Benevolent Fund, at 10, Red Lion Square, London, W.C.1—immediately following the above.

May 23rd.—Meeting of the Technical Development Committee, N.V.M.A., at 36, Gordon Square, London, W.C.1, 10.30 a.m.

Sept. 23rd-29th.—Sixty-ninth Annual General Meeting and Congress of the National Veterinary Medical Association, at Eastbourne.

R.C.V.S. Examinations

Wednesday, May 2nd.—Animal Management Examination commences at London.

Thursday, May 10th.—Entries for D.V.S.M. Examination due.

Tuesday, May 15th.—Pharmacology, etc., Examination (Revised Syllabus). Written Examination.

Thursday, May 17th.—Pharmacology, etc., Examination (Revised Syllabus). Orals and Practicals (London and Dublin).

Thursday, June 7th.—D.V.S.M. Written Examinations commence at Edinburgh.

Monday, June 11th.—D.V.S.M. Oral Examinations commence.

Thursday, June 21st.—M.R.C.V.S. Written Examinations.

Friday, June 22nd.—M.R.C.V.S. Written Examinations.

QUARTERLY MEETINGS OF COUNCIL AND STANDING COMMITTEES N.V.M.A. DURING 1951

The following dates are given for remaining meetings this year, chiefly to give members plenty of time to reserve hotel accommodation.

In Edinburgh

Wednesday, July 11th:
11 a.m. Home Appointments Committee.
2 p.m. Organising Committee.
4 p.m. Parliamentary and Public Relations Committee.

Thursday, July 12th:
11 a.m. Veterinary State Medicine Committee.
2 p.m. General Purposes and Finance Committee.

Friday, July 13th:
11 a.m. Council.

* * * * *

Glasgow University Degree Becomes Registrable under the Veterinary Surgeons Act

The third veterinary degree of a university has become registrable under the Veterinary Surgeons Act, 1948. An Order of the Privy Council has just been made granting this recognition to the degree of Bachelor of Veterinary Medicine and Surgery of the University of Glasgow. The universities previously recognised were firstly, Liverpool, and secondly, Bristol.

In Glasgow University the first year veterinary students are now taught in the main buildings of the university, and whilst the remaining years are still taught in the old buildings of the Glasgow Veterinary College, already new buildings are being erected on a site at Garscube. This is a handsome estate which has passed into the possession of the university and is conveniently adjacent to the centre of the city.

* * * * * *

ROYAL (DICK) VETERINARY COLLEGE

A provisional order to provide for the embodiment within the University of Edinburgh of the Royal (Dick) Veterinary College is at present before Parliament, and as no opposition to the order has been tabled it is expected that the order will come into force about the middle of May.

With the approach of the change from independent College to part of the University, the Board of Management of the College and officials of the University have decided that the occasion is one which should be marked in an appropriate way.

In order that all who have been associated with the College, particularly past and present students, may participate in some way in the celebrations, this prior notice is given so that those living at a distance may make arrangements to come to Edinburgh. As this is a memorable occasion it is hoped that as many old students of the College as possible will make a special effort to be present.

Thursday, May 24th, 7.30 p.m.—Reunion in the College of old students.

Friday, May 25:h.—Academic Holiday:—

10.0 a.m.—Meeting of staff and present students.

2.30 p.m.—Garden Party at Bush House, by invitation of the Board of Management of the College.

7.0 p.m.—Dinner in the Upper Library of the University of Edinburgh. (Invitations for this function will be issued by the University.)

8.0 p.m.—Dance in the McEwan Hall for all students, past and present. After the University dinner the Principal of the University will attend the dance.

* * * * *

LEGAL NOTES

Successful R.C.V.S. Prosecution in Cumberland

At the instance of the Royal College of Veterinary Surgeons, for whom Mr. J. Wheeler, of Warrington, appeared, Alan Ritson, of Kirkgate, Cockermouth, answered two summonses for practising and holding himself out as being prepared to practise veterinary surgery. The Cockermouth magistrates fined the defendant £2 2s. on each summons and £1 1s. costs.

It was alleged that Ritson had wrongly diagnosed pneumonia in two pigs which died after his treatment, and the defendant's

solicitor, Mr. W. M. Bell, Workington, said his client had spent most of his life treating animals. During five years in the Indian Army he had done a considerable amount of veterinary work and had attended lectures on veterinary science. His application for registration with the Royal College had been turned down.

* * * * *

PERSONAL

Births.—Lewis.—On April 14th, 1951, to Pegi, wife of G. D. Lewis, M.R.C.V.S., Springs, Threemilestone, Truro, Cornwall, a son (David Powys)—a brother for Wyn and Gwenda.

Thurston.—On April 15th, 1951, at the Patrick Stead Hospital, Halesworth, to Barbara (*née* Finnett) wife of George Thurston, a daughter—Gail.

. . . . . .

Golden Wedding.—Bowes—Crowe.—On April 19th, 1901, at St. Stephen's Church, Kirkstall, by the Rev. Edgerton Leigh (Vicar), assisted by the Rev. Canon Stratton (Vicar of St. Paul's, Leeds), Henry Gething Bowes, of Leeds, to Ethel, daughter of Mr. and Mrs. G. F. Crowe, of Highfield, Headingley. Present address: Headingley, Burpham, Guildford.

. . . . .

Bequest to the Royal College of Veterinary Surgeons.—Among the bequests made by the late Mr. George W. Saunders, formerly of 1, Heene Court Mansions, Heene Terrace, Worthing, is the sum of £100 to the Royal College of Veterinary Surgeons. A similar amount is bequeathed to the R.S.P.C.A.

* * * * *

R.C.V.S. OBITUARY

Mr. Alexander M. Trotter, M.R.C.V.S.

An Appreciation

By the death of Mr. A. M. Trotter, recorded in your last issue, there has passed away another of the pioneers of the profession as it exists to-day. Mr. Trotter qualified in 1893 and entered the service of Edinburgh Corporation as Veterinary Inspector, transferring to Glasgow in 1897. This was a period when controversy was raging concerning the transmissibility of the bovine tubercle bacillus to man. Trotter became interested in the question and bovine tuberculosis formed one of his main interests in his later life work.

On appointment to Glasgow his task was the supervision, from a public health aspect, of all dairy herds supplying milk to the city. A few years later he took over the meat inspection of the city which up to the time of his appointment had been a function of the Police. The standard of inspection up to that time was anything but high. Trotter set about training and organising a staff of inspectors to carry out proper routine inspection of carcases and, in consequence, raised considerably the criterion of meat inspection in the city. With the passing of the late Principal McCall, the duties in connection with the Diseases of Animals Acts and Orders were transferred to Mr. Trotter's department. Glanders and parasitic mange were at that time rampant in Glasgow and it was due in no small measure to the vigorous efforts of Mr. Trotter and his staff of veterinary assistants that these scourges were finally eliminated from the city. When the Government set up an Inter-departmental Committee to enquire into the question of meat inspection in Scotland he was appointed one of its members. As a result of this Committee's deliberations a uniform standard for the country was drawn up, this forming the basis for the Public Health (Scotland) Meat Regulations of 1923, which, with some minor amendments, are still in force to-day.

Mr. Trotter retired in 1934 and since then had interested himself in the running of a small farm back in his native Fifeshire. He had enjoyed good health throughout his long period of retirement from official duties, his death occurring after only a short period of illness.

S. G. A.

The funeral took place at Cathcart Cemetery in Glasgow, the profession being represented by Major Anderson, of Fife, and by Mr. A. Thomson and Mr. S. G. Abbott, of Glasgow.

* * * * *

UNIVERSITY OF LONDON B.Sc. (Vet. Sci.)

Kenneth Forbes Hosie, of the University of Glasgow, and Alan Frederick Roddis, of the University of Liverpool, have passed the B.Sc. (Veterinary Science) examination of the University of London.

THE ALDERSHOT SHOW

R.A.V.C. Revives the Farriery Competition

It will bode ill for this country, both from the military and civilian points of view, if the noble art of farriery is allowed a further decline from its present somewhat precarious position. As was to be expected, the Royal Army Veterinary Corps is determined to do all in its power to rectify matters and to this end, we are glad to learn, it is reviving the Farriery Competition which was so interesting and useful a feature of pre-war Aldershot Shows.

In itself, this year's Show will be one of exceptional importance and interest, inasmuch as its extension to three days—July 12th, 13th and 14th—may be said to represent elevation to an event worthy of being regarded in some measure as a substitute for the now cancelled Tattoo originally contemplated in connection with the Festival of Britain. It is hoped that their Majesties will attend, and the site—the Rushmoor Arena—is being subjected to particular preparation in consequence.

Our readers in general, therefore, may wish to note these dates, but it is possible that some further support may be forthcoming from practitioners in connection with the Farriery Competition, inasmuch as while Classes I and II are open to Warrant Officers and N.C.O.s only, and (Novices) to Army Farriers only, respectively, Class III is "open to the world," and encouragement to local farriers to seek fame, in addition to money prizes, medals and certificates, would not be amiss. Entries, which close on June 25th, should be sent to the Hon. Organising Secretary, Lt.-Colonel R. K. Chiesman, Show Officer, Steele's Road, Aldershot. The actual author of the project is Major J. H. Wilkins, whom we congratulate not only on his enterprise, but upon securing such good judges as Brigadier Heveningham, Major Colin Davenport, Lieut. (Q.M.) G. Singer, of the Army School of Farriery, and Mr. M. J. Clark, F.W.C.F. Judging commences at 10 a.m. on each of the three days, one day being devoted to each class, in order as numbered.

* * * * *

VETERINARY CERTIFICATE FOR EXPORT OF CATTLE TO NEW ZEALAND

An Order in Council, Serial No. 1951/41, dated March 15th, 1951, and coming into force within three months from that date, states that the Veterinary Certificate for cattle being exported to New Zealand will require to be differently worded to exclude the johnin test.

The new Certificate will be worded as follows:

VETERINARIAN'S CERTIFICATE TO ACCOMPANY CATTLE FROM GREAT BRITAIN TO NEW ZEALAND

I (insert name and qualification), a Veterinarian in the employ of (approved for the purpose by) the Ministry of Agriculture and Fisheries in England, hereby certify:—

(*a*) That on the.....day of....., 19.., being a date within the period of thirty days immediately preceding the date of removal of the cattle referred to in the declaration of (insert full name and address of owner), to a quarantine station under the control of the said Ministry, I examined the said cattle;

(*b*) That I found the said cattle free from infectious and contagious diseases;

(*c*) That within the period aforesaid—namely, on the ....day of..... 19..—I applied the Mammalian tuberculin test and the Avian tuberculin test to the said cattle with negative results;

(*d*) That within the period aforesaid—namely, on the....day of..... 19..—I subjected the said cattle to the agglutination test for Brucellosis with negative results or (I am satisfied after due enquiry that the said cattle have been vaccinated against Brucellosis); and

(*e*) That to the best of my knowledge and belief the said cattle have not been in direct or indirect contact with any stock suffering from or infected with Johne's disease and have not at any time been on land where Johne's disease is known to occur

Dated at.....this.....day of....., 19...

Signature.....

In addition, a new Order has come into force declaring rickettsiae to be diseases under the Stock Act. This follows the case of Q fever found in a goat in quarantine in New Zealand after its arrival from the United Kingdom.

* * * * *

WARBLE FLY

Stock-owners and persons in charge of cattle are reminded that by the Warble Fly (Dressing of Cattle) Order of 1948 they are required during the dressing season, which extends to June 30th, to treat with a derris dressing all cattle visibly infested with maggots of the warble fly, and that the dressings must be applied at monthly intervals for as long as the maggots continue to appear under the skin. Particular attention should be paid to outlying stock. Copies of the Order and the Ministry's advisory leaflet about the warble fly may be obtained from Animal Health Division, Ministry of Agriculture and Fisheries, Hook Rise, Tolworth, Surbiton, Surrey.

FOUR COUNTIES TUBERCULOSIS-FREE AREA EXTENSIONS IN WALES

In its issue of April 14th, the *Cambrian News* reports that, at a recent meeting, the Executive Committee of Merioneth National Farmers' Union discussed a letter from the Ministry stating that it had been decided that Merioneth, Montgomery, Brecon and Radnor would be suitable as an area for their eradication of tuberculosis in cattle plan within the next few years, it being considered preferable to deal with reasonably large areas at a time. There were difficulties in undertaking any steps in single and isolated counties. The four counties would form a natural extension to the area in South-west Wales which had already been selected.

Referring to the Committee's suggestion that the appointment of additional veterinary inspectors by the Ministry would result in attestation of herds throughout the county being more rapidly done, the Ministry stated that such officers were below full strength at present and heavy demands were falling upon them. "For this reason," added the Ministry, "it is not possible to increase the number of veterinary officers in the Ministry's service in Merioneth."

Touching upon the same question, a letter from the Clerk of the County Council was read, forwarding copy of a letter received from Messrs. J. Wynne Owen and J. E. Tudor, veterinary surgeons, Dolgelley, complaining that a resolution passed at a recent meeting of the Diseases of Animals Committee was erroneous in that it stated there had been delay in inspecting herds. They covered an appreciable area of the county, and at the moment only four applications were outstanding. The letter added that the percentage of attested herds was over 60, this being an increase of 10 per cent. on the position eight months previous. They considered this increase was a satisfactory rate of progress. With regard to the suggested dearth of veterinary surgeons, this was incorrect, as the present position would bear favourable comparison with any county in the British Isles. Any statements to the contrary were therefore misleading and contradictory.

Mr. L. J. Humphreys: There appears to be a misunderstanding somewhere. I was at the Diseases of Animals Committee and the complaint was not as to any shortage of veterinary surgeons, but the shortage of the Ministry's veterinary officers to carry on with the work. We have no complaint at all against the local veterinary surgeons, who are doing excellent work, and there has been no delay on their part.

This view was supported by Mr. R. P. Roberts.

Mr. Edward Jones, Hafod, stated that there was no complaints of delay from the Corwen end.

It was decided to reply to the County Council on these lines.

* * * * *

LARGE HEREFORD CATTLE CONSIGNMENT FOR ISRAEL

The largest single consignment of pedigree Hereford stock ever to leave this country is about to be shipped to Israel. Comprising 200 head of calves, it was bought on behalf of the Israeli Government by Dr. Y. Goor, M.R.C.V.S., head of that country's Field Veterinary Services, at a cost of £15,000, to establish beef herds to meet the needs of Israel's population, which has expanded rapidly as a result of emigration from European countries since the war.

The young Herefords, bought from 28 different breeders, mainly in Herefordshire, will be the first beef-type cattle to be imported into Israel. They will go to the Government's experimental station near Haifa, and the bulls—there are eleven bull calves in the consignment—will eventually be crossed through artificial insemination with low-yielding native dairy stock, to produce beef-type animals. Herefords have been selected because of the hardiness of the breed—their ability to stand up to drought conditions and thrive on poor pastures.

The consignment was in the nature of an experiment (said Dr. Goor) because the Herefords would have to contend with a score of diseases, including tick-borne diseases, deadly to cattle. The stock chosen was very young, because cattle stood a better chance of survival in Israel if vaccinated against disease at an early age. "If the experiment is a success," continued Dr. Goor, "we shall return and compete with South American and Australian buyers for your better-class stock."

* * * * *

Capt A. M. Keith, President of the Tyneside Agricultural Society, said at the Society's annual meeting that it was deplorable that they should have to struggle with their horse-breeding and make no headway. Last year the Society paid £12 10s. on every foal born to a mare served by their premium horse, yet they were told that when those foals were two years old, they were going to butchers' shops.—*Farmer & Stock-breeder.*

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

SWINE FEVER:

Cheshire.—Yew Tree Farm, Ward End, Adlington, Macclesfield (Apr. 19th).

Cumberland.—High Stowbank, Lamplugh, Workington (Apr. 18th).

Derbys.—Spondon Piggeries, Spondon (Apr. 16th); 24, Queen Street, South Normanton (Apr. 17th).

Durham.—5, Plawsworth Road, Sacriston (Apr. 16th).

Midlothian.—Todhills, Dalkeith, Midlothian (Apr. 16th).

Norfolk.—Pied Bridge Farm, Redenhall, Harleston (Apr. 16th); Abbey Farm, East Beckham, Norwich (Apr. 20th).

Notts.—36, Handstubbin Road, Selston; 227, Regent Street, Beeston, Nottingham (Apr. 16th).

Worcs.—Claybank Farm, Tanworth Lane, Redditch (Apr. 17th).

Yorks (E.R.).—Main Street, Swanland, North Ferriby (Apr. 19th); Valiant Soldier Yard, Norwood, Beverley (Apr. 21st).

Yorks (W.R.).—Burn House, Burn, Selby (Apr. 16th); Red Roof, Hill Top, Bardsey, East Keswick, Leeds (Apr. 21st).

* * * * *

DRUG RESISTANCE: A "SINISTER" DEVELOPMENT

"During the past 15 years chemotherapeutic research has produced many potent weapons for use against disease, and a cursory glance at the number of substances available, with their range of activity, may give the impression that almost every infection can be cured or controlled by one or other of these drugs," observes the *Pharmaceutical Journal* in its issue of April 21st. "Recently (February 10th, p. 95) we referred to the limitations of chemotherapy and to the comments made by Professor Garrod on the resistance of bacteria to some of the new therapeutic agents. The importance of this subject is emphasised by Dr. Stanley Banks, who, in an article contributed to the symposium on chemotherapy in this month's *Practitioner*, describes the development of drug resistance as 'sinister,' adding that a continuous succession of new therapeutic drugs may be required if control of acute infections is to be maintained.

"One method of dealing with resistant organisms is by giving two drugs in combination, a procedure which will sometimes produce more satisfactory results than the administration of a single drug. The most recent contribution to this aspect of chemotherapy appears in the *British Medical Journal* for March 31st, where a report is made on four cases of subacute bacterial endocarditis which did not respond to treatment with penicillin alone. In each instance the infecting organism was subjected to laboratory tests to measure its resistance to penicillin, streptomycin, chloramphenicol and aureomycin. Thereafter, the antibiotics were given alone and in different combinations; the most satisfactory results were produced by a combination of penicillin and streptomycin, which appeared to control the infection in three out of the four cases. While it is possible for two antibiotics to act synergistically, as in this instance, it has also been shown that aureomycin and chloramphenicol can reduce the bactericidal action of penicillin on certain strains of organisms, and that terramycin may behave similarly. Laboratory work along these lines has been proceeding both here and in America, although the clinical significance of these findings has not yet been assessed. There is no doubt that the introduction of the sulphonamides, and, later, the antibiotics has profoundly altered the prognosis in a number of diseases where the mortality rate formerly was high. But these drugs have produced their own problems, which cannot be regarded lightly. Relatively few toxic reactions have been reported in the case of the antibiotics and the main problem is that of drug resistance, on which laboratory studies are now concentrated."

* * * * *

A FAMOUS SHEEP-DOG

Mr. James Wilson, Whitehope, Innerleithen, has had the misfortune to lose his famous sheep-dog Glen, which won the Scottish national at Stirling in 1946, was second in qualifying at Edinburgh the same year, and supreme champion at Edinburgh on the final day of the international trials. Glen also won the Scottish aggregate cup for dog gaining most points over the three countries. He won these very high honours (the highest a dog can win) under trying circumstances, having had a severe attack of distemper between national and international events. In 1948 Glen won the

qualifying trials at Worcester and the supreme championship on the final day. Here again he won the Scottish aggregate cup and the cup for dog gaining most points over the three countries.

In 1949 Glen lost his sight following the attack of distemper in 1946. It must linger long in the memories of those fortunate enough to have witnessed his run in the final at Edinburgh. His gather, brilliant fetch, drive, and perfect shedding and penning concluded the most outstanding performances ever seen at any international trials.—*Farming News.*

* * * * *

The 1951 Register of Accredited Poultry Breeding Stations and Accredited Hatcheries in England and Wales, with details of their stock, is now available and may be obtained, post free, on application to the Poultry Branch of the Ministry of Agriculture and Fisheries at 28-32, Chester Terrace, Regent's Park, London, N.W.1.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

THE ECONOMICS OF VETERINARY PRACTICE

Sir,—The remarks of those commenting upon the economics of veterinary practice mainly have been confined to the consideration of the scale of veterinary fees. Distressing as such considerations may be, the situation is much more disturbing when it is viewed from a broader angle.

There are two cardinal features in the present financial balance of the country which affect veterinary practice. One affects agricultural practice, *viz.*, that the present level of taxation is at a critical peak, and that any government interested in its own future will be unwilling to raise that critical level by granting further subsidies.

Logically, one cannot regard the Attestation Scheme as being likely to yield indefinite remuneration to veterinary surgeons, and, when that Scheme dies a natural death—as it is bound to do in certain areas—it is not likely to be superseded by another scheme of similar lucrative proportions. Further, the State may at any moment find it imperative either to reduce or transfer certain subsidies, and, during that process, the practical value of "tuberculosis-free" milk may be severely questioned. Briefly, why not pasteurise all milk and provide the destroyed qualities in some other medium? A decision on these lines—which is certainly within the bounds of possibility—would place a vast number of agricultural practices in a condition approaching jeopardy.

The second cardinal feature is that, although true poverty is now rare in this country, there has been a drastic reduction in the spending power of the middle-classes, which were, until recently, the income group which formed the backbone of the small-animal practitioner's clientele. No doubt the practitioner would feel this stringency no more than any other member of the community were it not for the fact that the various animal welfare societies can afford to undercut him outrageously. It is, then, only logical to assume that the average city practitioner will find it increasingly difficult to maintain effective competition with clinics which are supported by lavish endowments, which benefit by the many diverse methods of advertisement, and which charge next to nothing for the execution of skilled veterinary work. The contemplation of this depressing position is rendered even more painful by the conviction that the average client of these welfare societies is able to pay a reasonable fee.

In view of the above observations, I think it will be almost impossible for the private veterinary surgeon to look to the future with anything more substantial than hope. Certainly, the prospects of private practice cannot be said to offer any promise of reasonable and lasting prosperity. Therefore, Mr. Crosfield's recommendation to consider and outline an acceptable form of national veterinary service would seem to be not merely a prudent suggestion, but rather a matter of pressing urgency.

Yours faithfully,

39a, Clifton Gardens, Maida Vale, W9. DENIS BRANAGAN.

April 15th, 1951.

* * * * *

BREAKDOWN IN STUDENTS

Sir,—In your footnote to a report of *The Lancet's* observations on undergraduate mental disorders I find a flippancy which is disturbing.

Since 1945 at one college I can recall the tragedy of a suicide; the failure to pass finals by an excellent student because of a nervous breakdown resulting in speech impediment, haemorrhoids and other psychosomatic symptoms; and a student who lost her voice completely prior to oral examinations. Many other cases will no doubt have escaped my notice.

To claim that veterinary students are in any way superior to other beings in this respect is to turn one's back on a serious problem and leaves unpleasant implications about those who have suffered.

Yours faithfully,

24, Vincent Avenue, Stratford-upon-Avon, Warwickshire. MICHAEL R. W. LEWIS.

April 9th, 1951.

* * * * *

THE DANGEROUS DRUGS REGULATIONS IN VETERINARY PRACTICE

Sir,—On page 297 of your publication of April 21st, 1951, there are contributed certain statements regarding the application of the Dangerous Drugs Regulations. May I say, at once, that the statement concerning Personal Administration is wholly in error, for the veterinary surgeon or veterinary practitioner is *not required to record supplies personally made to an animal* under Regulation No. 11(1)(a). Under this Regulation, only supplies to *persons* are involved. For this same reason the veterinary surgeon is not grouped with a medical practitioner or registered dentist in Regulation No. 11(7)(1).

For many years I have known that the patients of the veterinary surgeon are highly intelligent and sagacious animals, but I have yet to learn that they have now reached that stage in evolution that entitles them to be classed together as *Persons.*

In May, 1938, an important notice on the D.D.R. 1937 was sent out by the Secretary of the R.C.V.S. (the late Dr. Fred Bullock) to every veterinary surgeon on the Register, setting out his duties in making the required records, wherein it is clearly pointed out: "It is not necessary to record in the Register drugs *personally administered* by the veterinary surgeon to an animal patient." I have all the amendments to the D.D.R. up to the end of 1950, and nowhere can I find anything that would rescind what Dr. Bullock circulated on behalf of the R.C.V.S. in May, 1938.

Yours faithfully,

23, Queen's Gate Gardens, S.W.7. THOMAS LISHMAN.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange*	Sheep Scab	Swine Fever
March 16th to 31st 1951	20	—	11	—	—	34
Corresponding period in—						
1950	22	3	16	—	—	1
1949	7	3	22	—	5	—
1948	4	—	20	—	3	—
Jan. 1st to Mar. 31st, 1951	146	17	439	—	4	210
Corresponding period in—						
1950	126	12	52	—	18	1
1949	41	9	123	—	26	4
1948	29	—	149	1	21	7

* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at March 31st, 1951, was as follows:—

England	Wales	Scotland	Total (Great Britain)
28,108	16,453	14,135	58,696